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MACHINE CODE Pt 8 (FINAL) 44

Feb/Mar 1984

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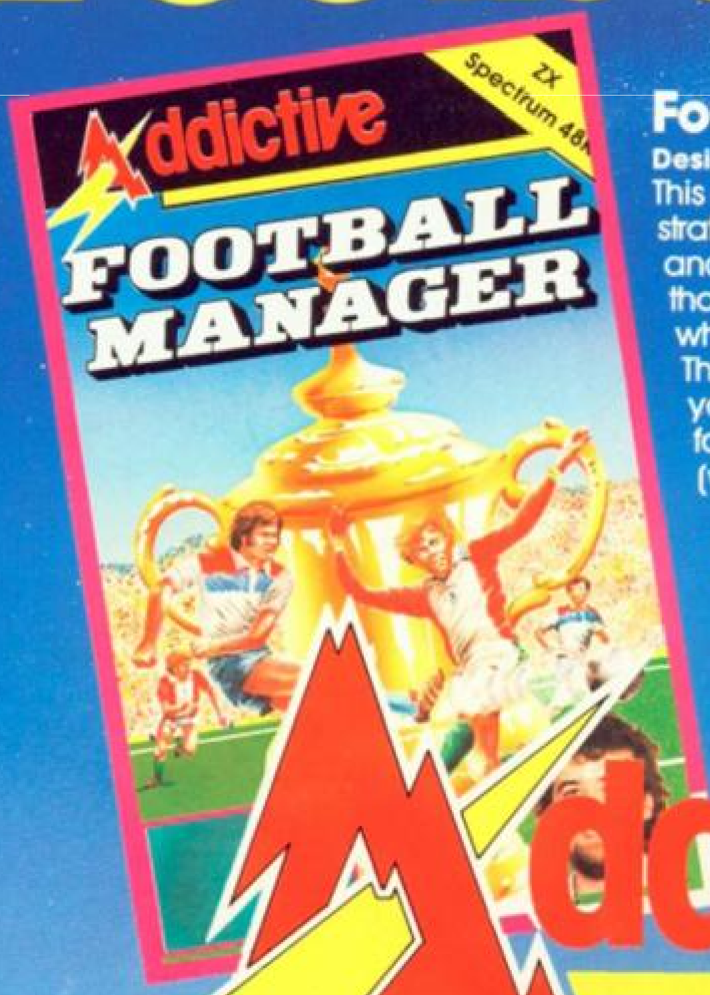
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*ZX81 Chart, Home Computing Weekly 16.8.83

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KRAKATOA ESCAPE FROM KRAKATOA is a completely amazing piece of programming. Fantastic full-screen graphics and great music. Your helicopter is huge, with a giant rotor. The explosions from the volcano are very convincing indeed. It really has the biggest graphics and the most detailed scenery we've ever seen - and it's very playable. A year ago, it would not have been possible! No joysticks. *(Abbex)* £5.95.

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HALLS OF THE THINGS *The most exciting and innovative game I have seen for the Spectrum." (ZXComp)* Explore an 8-storey maze, find treasures, avoid nasties. BUT, this time, you can SEE exactly where you are and what you're doing as the maze scrolls as fast as you can move. Brilliant graphics (try waving your sword about!) and 19 command keys. No joysticks. *(Crystal)* £7.50.

GO TO JAIL *"Excellent graphics are used to make a very impressive display indeed... highly recommended." (ZXComp)* The best computer version of the famous game we've ever seen. From 2 to 5 players (including the Spectrum at last! It's ruthless, but honest.) Every original feature is faithfully reproduced and the screen display is miraculous. No joysticks. *(Automata)* £6.00.

16/48K SPECTRUM

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PUTING

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ZX Computing is constantly on the look-out for well-written articles and programs. If you think that your efforts meet our standards, please feel free to submit your work to us for consideration.

All submitted material should be typed if possible; handwritten work will be considered, but please use your neatest handwriting. Any programs submitted should be listed, a cassette of your program alone will not be considered. All programs must come complete with a full explanation of the operation and, where relevant, the structure; Spectrum programs should be accompanied with a cassette of the program as well as the listing.

All submissions will be acknowledged and any published work will be paid for at competitive rates. All work for consideration should be sent to the Editor at our Golden Square address.

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Welcome

Once upon a time...

An unsuccessful amateur musician was setting up his equipment in the local Darby and Joan emporium in readiness to perform such delights as Led Zep's "Rock'n Roll" to geriatric head bangers, when a strange, unearthly sound issuing from a large box caught his attention.

Curiosity aroused, he continued to set up his gear until, the suspense being too great to bear, he sidled along the bar and up to the first Space Invaders machine that he'd ever seen.

For many moons this son of Pan squandered coins of the realm to try and protect unwitting civilisation from destruction, annihilation, and the Intergalactic Tax Office. New and more sophisticated beings evolved for him to fight against, Galaxians, Defender, Scramble... until, in a fit of desperation, our hero, risking all on an understanding bank manager, invested in a Video Computer System in order to get in some extra practice against the alien horde — Ataribie mistake.

As was already mentioned, our hero was a curious character by nature and also just a little devious.

"Ah ha", though he, "If I could find out how it works then I could probably beat them!"

And so he purchased the "Computer Programming" cartridge and keyboard set which gave him access to 64 BYTES of programmable RAM.

Bells, stars, rockets and all manner of mental pyrotechnics were the order of the day, music abandoned, this fickle fellow follow the siren call of the mighty microchip and, only six months later, purchased a ZX81 with the incredible 16K RAM.

Well and truly bug-bitten, every spare moment was spent on this technological tantaliser. Who was master and who was servant was hard to determine — Whiteouts, Rampack wobble, LOAD/SAVE problems all became the new aliens that he had to defeat until that fateful day, his birthday, when he was given a book on the ultimate enemy, YES, the dreaded machine code!

A new era of frustration was born, but he persevered, his friends ignored him, his parents thought he'd emigrated, the cat did. A vague, shadowy figure and the mocking sound of "LD A, 0 : DJNZ —3" was all anyone ever heard of him.

Happily ever after . . .

But eventually the evil spell weakened and the great sorcerer Sinclair started to lose his acolyte. He started to converse about such diverse subjects as food and money until the mighty magi pulled his master stroke — the Spectrum.

Once again entangled in the complexities of the disease known to the medical fraternity as "Computus Fanaticus" with its attendant subillnesses "Eyeballus Strainus" and "Fingerdigit Psority", he became an incurable case. He became addicted to buying every magazine on the market, writing to them, producing programs, reviews, articles, ideas, and generally made such a nuisance of himself that, to keep him occupied, someone eventually said, "I know, we'll give him a job which will keep him busy and out of our hair".

And they did.

So hello everybody and welcome to this issue of *ZX Computing.*

There's so much in it...

Seriously though, I'm proud to be in the Editor's chair, especially after it has seen the posteriors of such famous and competent personalities as Tim Hartnell and Roger Munford. Roger has moved onwards and upwards and I'm sure you will all join me in wishing him much happiness and success.

So, What's in this issue? Most of the items still bear Roger's seal of approval but I have tried to select a mixed bag of goodies, ranging from beginners programming, Patience, to expert with Toni Baker's Machine code program which is a first class word processor for the Spectrum!

All your old favourites are here, reviews by our usual team of writers, news on all the fields of Sinclairology and of course games, utilities, hints and tips and useful programs galore all written by your own brilliant selves.

Ed's Project

On taking the seat of power I decided that the most significant contribution I could make to *ZX Computing* would be to produce clearer listings. In fact the few complaints that I read all seemed to be related to this, so I started what has been fondly called Ray's Project (or folly !).

I am trying to link a ZX81 and a Spectrum to a good dot matrix printer, a Shinwa CP80. In order to do this I wrote to several companies asking for help and I also decided that, as my typing is of one finger &%$ variety, it would be more than useful if wordprocessing was feasible. Resisting the urge to get a BBC, I wrote yet more letters. The results of my search are eye opening, and I'll be writing about the outcome in future issues. Meanwhile in this issue is an item on one of my earlier adventures with the Alphacom 32 printer.

I would like to thank personally all the companies involved for their assistance and will reveal all later, but special mention must be made of the DK'Tronics-keyboard, Kempston-Centronics interface, Memopak-ZX81 interface and hi-res graphics unit (I know there's a way to screen copy listings including graphics with this, but I haven't figured it out — YET), Micro-Wordprocessor, Sinclair Research — of course, and Tasman-Wordprocessor and interface.

A few of the programs in this issue have been produced using some of this mahcinery, see if you can spot them and tell us, if you have time, your opinions.

Ed's Comment

I was surprised at the lack of ZX81 software which was sent for review, only ONE program dropped through the door! A few quick phone calls produced a little more, but you will notice that the ZX review section is a little sparse this month.

Again my thanks to companies who rallied round; Sinclair Research, Artic, Phipps Associates, and JRS. I am a great supporter of both machines and hope and believe that the ZX81 has still got a good deal of life in it. *ZX Computing* will continue to support the ZX81, as long as it is being used.

Software for the '81 was originally a mail order business and it looks as though it will return to that form. The boss of Mikro-Gen made an interesting comment to me at the Northern Computer Fair when he said that "It's not the software companies who are killing the ZX81, it's the shops who refuse to stock the software. We have sold AS MANY programs for the ZX81 as for the Spectrum and have sold out of tapes!" This seems to be a case of the shop dictating to the customer so to try it out, I went to a well known store and asked for an '81 program and was told "You should buy a Spectrum".

Of course we want to review all the latest programs for both computers, but at the moment anyone producing ZX81 programs has a good chance of being reviewed due to the decline in new releases. So keep 'em coming folks!

Contributions

We are always on the lookout for good programs and articles for future issues of *ZX Computing,* and where better to look than to our own readers. If, when reading through the magazine, you think you can write programs

as well, or better than, our present contributors, then let's hear from you.

All contributions are, of course, paid for at very competitive rates. So if you've got your eye on a new ZX add-on or you'd just like to supplement your pocket money, get writing! It is vital, though, that all the programs you send us are totally original, and not 'borrowed' or 'adapted' from other magazines or books. (When Tim Hartnell was sitting in the Editor's chair, he even received 'original' contributions he himself had written for his own books!)

Any kind of program (business, domestic, educational, or just fun) will be welcomed, but particularly those which use ZX BASIC in clever and efficient ways, or those which employ certain routines which can be re-used on other programs.

Program listings are vital, along with a clear explanation of how the program is constructed, what it does and what the user can expect to see once the program is RUN (a screen dump is particularly valuable in this respect). When submitting Spectrum programs, it is very important to remember to enclose a cassette of the program as well as the listing, as this will allow us to check the program before publication.

Endlines

At the end of this issue there is a page which I would ask you to complete and return to us: I consider myself to be a custodian of your magazine and want to put in what you want to read. I've therefore put together a little questionnaire and if you will complete it for me I'll feed all the information into my Spectrum and see how, and if I can improve *ZX Computing.*

Enough said, on with the show...

Ray Elder



Questions

Dear ZX Computing,
I am writing in desperation. I have owned a ZX81 for over a year now and to date have never been successful when trying to SAVE. I have tried most of the 'tricks' as well as following the advice given in the manual and other publications. I have also tried three different types of cassette player, including a so-called computer-compatible model.

Incidentally, very few problems have been experienced when LOADing. Any ideas?
Yours faithfully,

I G Windybank
Warwicks

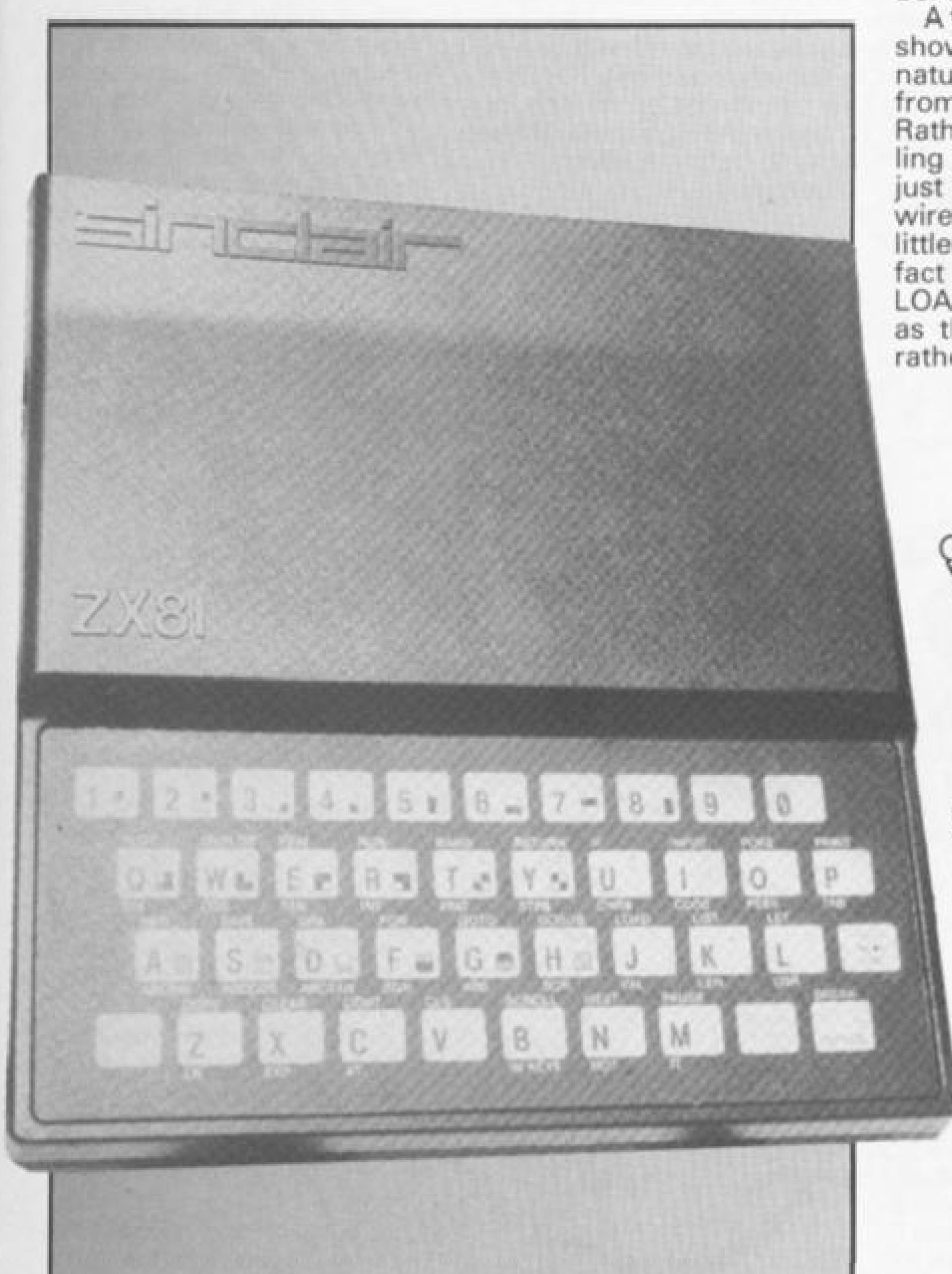
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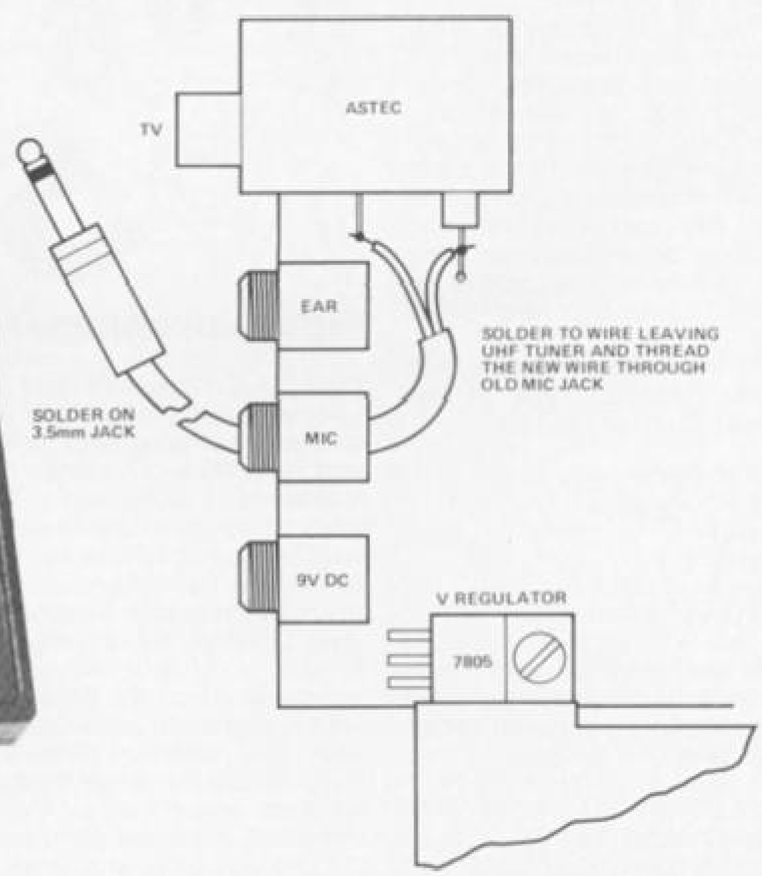
Dear ZX Computing,
I thought that you may be interested in an exceptionally simple way to improve the LOADing of a ZX81.

A few months ago my ZX81 showed its temperamental nature by refusing to give any from the 3.5 microphone jack. Rather than totally dismantling the '81 to find the fault I just permanently attached a wire to the computer. This little modification relies on the fact that the VDU, when LOADing gets the same signal as the save jack, hence the rather ugly black and white lines when LOADing/SAVEing.

As the diagram shows, I attached the wire to the small silver box of electronics which gives the VHF output. As a bonus, this also gives a high pitched signal lasting six seconds before the actual program starts SAVEing. This is useful for if you listen to the cassette until the signal starts and start LOADing on the signal, you are virtually guaranteed perfect LOADing/SAVEing.
Yours faithfully,

A Turner
Hull







And not many people know that

It is a generally known fact that it is impossible to break into a machine code program while it is running without turning your computer off and then on again; but this short machine code routine will prove otherwise.

Once called, it brings into action a "Machine code break key" which allows the user to stop any machine code program, regardless of what stage of execution the program has reached.

This is obviously a very powerful and useful feature to have at your disposal, especially if you are developing your own machine code programs where crashes are frequent; instead of having to turn the computer off and starting again you can stop the program and return to BASIC using the new break key.

To enter the program you firstly need to type in the loader program below:

```
1 REM (130 characters)
2 LET L=23835
3 INPUT I
4 POKE L,I
5 LET L=L+1
6 GO TO 3
```

RUN the program and enter the numbers below, one by one, pressing ENTER after each one.

62,25,237,71,237,94,201,255,
243,217,245,1,254,191,237,
120,254,188,40,4,217,241,
251,201,251,207,255.

You may be wondering why the REM statement has 130 characters after it when the machine code routine is only 27 bytes long. The reason for this is very complicated but I can assure you that it is very necessary, so do not leave any of the characters out.

After you have entered the machine code, delete lines 2-6 and enter RANDOMIZE USR 23835. The machine code break key will now be working; it is very important that you do not delete the REM statment at any time or the computer will crash.

To use the break key while in a machine code program press the L and ENTER keys down at the same time. You will hear a short beep followed by a "O OK" report. The machine will have returned to BASIC and its memory will be intact.

Yours faithfully,

Richard Wright,
Surrey.



Figure problems?

Dear ZX Computing,
I have had my 16K ZX81 for two months now and at the age of 40+ I think I've mastered it quite well. As I wish to use it for business as well as pleasure I was pleased to find the Bank Account program by Professor Salaman in your Oct/Nov issue. I typed it in and it ran but would not accept any figures. Whatever I put in came out as 0.00. However, by deleting line 303 GOSUB 900 the program then worked perfectly and accepted my input figures.

I did not have the time to continue so I SAVEd the program to use later. Unfortunately, I had difficulty in LOADing it again but I think it is due to my equipment being faulty. I have ordered the Elinca ZX Tapeloader you previewed in the Oct/Nov issue so, hopefully this should no longer be a problem.

I now have ZX Computing on order from the newsagents as I think it is well worth the money being crammed full of useful articles and programs and I am trying to build up a collection for my five year old grandson and two teenage daughters.

Yours faithfully,

Mrs J F Hodge
Berks

Not so lucky dice

Dear ZX Computing,
I tried to use the programs on pages 27 (Lucky Dice) and 110 (3D Mover) in the Aug/Sept edition of ZX Computing but have run into difficulties.

In the former the graphics seem to have been left out altogether and line 10 will not run. In the latter the program stops showing B/680. Are you able to help me please?

Yours faithfully,

John S Howard Vine
Surrey

I'm sorry about the problems, John. Lucky Dice was corrected last issue and the errant line in 3D Mover should read:

*660 LET A=PEEK 16396+256*PEEK 16397*





Party Tricks?

Dear ZX Computing,
We are planning a series of television programmes on the use of micro computers and are looking for two groups of people — first, celebrities who love messing with their micros and second, any micro maniacs who have developed extraordinary uses for their computers. We do want extraordinary uses — not just unusual games but blowing up balloons or feeding the dog.

Can any of your readers help us I wonder? If so, perhaps they could write to me direct.

Yours faithfully,

Adam Hart-Davis, Producer
Yorkshire Television Ltd
The Television Centre
Leeds LS3 1JS

Golf problems

Dear ZX Computing,
I have been a regular reader of ZX Computing for a few months now and my opportunity came last week (when I bought a Spectrum) to try out the Golf and Space Attack programs in the Oct/Nov issue.

Being a complete beginner to computing it took me a while to program Space Attack and I was pleased when I had finished it. After correcting a few mistakes (mine of course), I ran it, checked it and SAVEd it. Having successfully completed that program, I felt con-

fident enough to attempt the Golf game.

It took me two evenings, non-stop to type in the program and when finished I ran it, fully expecting to see that I'd made a mistake or two. Unfortunately, up on the screen came 2 variable not found 2520;2

I checked and rechecked and found nothing wrong, as did a friend. Not being one to give up easily, I concentrated on line 2520 and came up with 2515 LET fairway=6 and 2516 LET green=4

Once these two lines were typed in the program worked correctly.

I would like you opinion as to whether it is just my Spectrum that needs these extra lines or is there an omission in the program?

Yours faithfully,

Stephen J Moffat
Glasgow

PS Very good magazine!

Thanks for your help Stephen. These lines should have been initialised on lines 1380 and 1780. We apologise for any problems that readers have found with the Golf program and would be pleased to send out a corrected listing on receipt of an sae. Please write to ZX Computing, Golf Listing, No 1, Golden Square, London W1R 3AB.





Drive on

Dear ZX Computing,
I am thinking about puchasing a ZX Microdrive but before doing so I would like to know if you can SAVE programs in the same way as on an audio cassette, that is by locating programs at various points on the disc.

Is it possible to SAVE many short programs on one disc?

Yours faithfully,

Chris Moss
Essex

Yes. This and the speed of search with high speed loading is what makes the Microdrive so exciting.

A slap on the wrist

Dear ZX Computing,
Having recently been given a ZX81 I purchased the Oct/Nov copy of ZX Computing. I am bitterly disappointed at the result of this purchase as almost all the programs that I have tried have either failed to run or been impossible to read.

For example in Fruit Machine on page 48, line 75 should read A$ and line 90 cannot be inserted. LET A$...... should be a separate line inserted at the beginning of the program. Also, giving the character codes for the graphics is ludicrous and just makes life difficult. Otherwise it is a clever little game.

Foolishly perhaps I turned to Grand Prix Driver on page 13. This appears to be a total disaster area. I think there are some lines missing between 800 and 850 and as far as I can tell the graphics between 2113 and 2440 are from another game! The main display (4000 to 4220) seems to be a black rectangle but the printing is so poor that some of it may be meant to be grey — who knows?

What a shambles.

Yours faithfully,

J N Burke
Herts

Lines 2113-2440 in Grand Prix Driver are OIL SLICKS. Although I feel that your criticisms are a bit strong, as you will have read, it is my intention to improve the listings (Editor's Project) but we're not afraid of criticism are we...(sulk).

NOTICE

Some of the programs in this issue have been produced on a different dot matrix printer in an effort to improve the clarity of the listings. The User Defined Graphics have been replaced by the letters A to U which are the natural state of these characters. In the following programs make sure the characters entered in the lines given are entered in grahics mode.

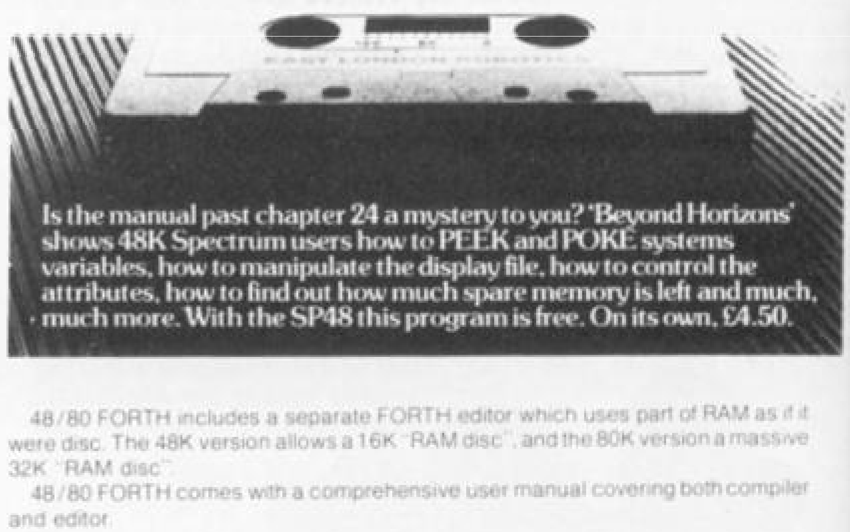
DEPTH CHARGE: lines 130, 300, 310, 610, 745, 3060, 3090
PELMANISM: lines 127, 413, 9700
SQUARES: lines 3, 190
WALL WALK: lines 50, 60, 100, 150, 160, 170, 180, 200, 213, 300, 310, 380, 400, 405, 410, 470, 610, 620, 640, 720, 740, 780, 790, 800, 820
DUCK SHOOT: lines 19, 40

WARNING

Since preparing this issue we have found that programs which use the IN function to read the keyboard sometimes don't work on the latest issue 3 Spectrums. The easy solution is to replace them with suitable INKEY$ functions. If you have purchased your Spectrum recently and are not yet experienced enough to alter them may I humbly suggest that you wait until you know a little more before attempting to enter them. We will be bearing this in mind when selecting programs for the next issue — my apologies to you all.

NEW PRODUCT
48/80 FORTH

Extend your 16k Spectrum to 48k for just £23·00. And get a Free program worth £4·50 into the bargain.



Is the manual past chapter 24 a mystery to you? 'Beyond Horizons' shows 48K Spectrum users how to PEEK and POKE systems variables, how to manipulate the display file, how to control the attributes, how to find out how much spare memory is left and much, much more. With the SP48 this program is free. On its own, £4.50.

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Then all you need to do is LOAD our specially written 48K guide program, 'Beyond Horizons', and your 48K computer will guide you through its memory with no need to labour through manuals. This will save you time, because we all know how easy it is to get lost with memory maps.

SP80 Paged Memory Extension — £46

This ingenious device gives a 16K Spectrum two memory banks of 32K each and a massive total of 80K of RAM. It can be used as a standard 48K machine, but pages can be switched by software instructions within your program. The SP80 is not recommended for absolute beginners unless used with 48/80 FORTH.

Fitting, power consumption and Sinclair add-on compatibility are identical to the SP48. Fit and Test service at our premises £3, by registered post £7.

48/80 FORTH — £14.95

This new FORTH compiler/editor is the latest, best and most complete version of FIG-FORTH for the Spectrum. Each tape includes both a 48K version and an 80K version. (Don't forget that an SP48 can be part exchanged for an SP80.)

48/80 FORTH gives you the speed of machine code with the programming simplicity of BASIC, and is ideal for games-writing. Unlike other FORTH versions, all the Spectrum's excellent graphics commands are retained, and sound is still available using BEEP. Cassette handling routines are also included.

48/80 FORTH includes a separate FORTH editor which uses part of RAM as if it were disc. The 48K version allows a 16K "RAM disc", and the 80K version a massive 32K "RAM disc".

48/80 FORTH comes with a comprehensive user manual covering both compiler and editor.

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This classic piece of software loads ZX81 BASIC programs and arrays straight onto your Spectrum, ready for SAVEing and EDITing. It can do in a few minutes what would normally take weeks of keyboard time.

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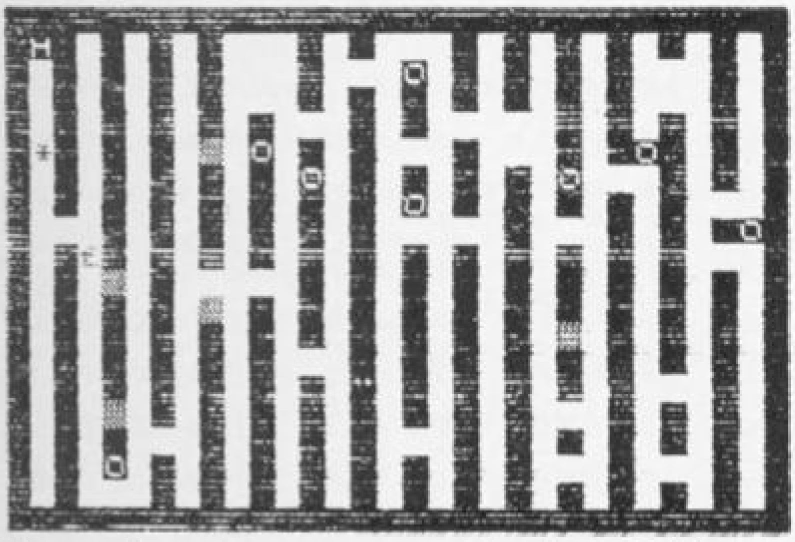
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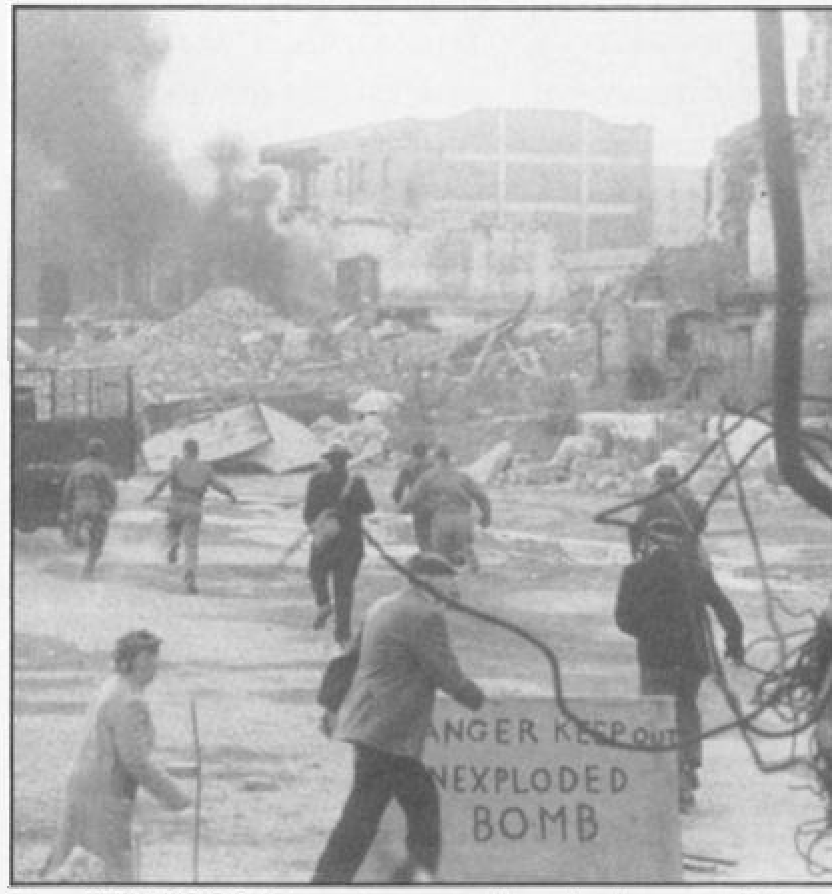
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EAST LONDON ROBOTICS

Danger UXB

You'll need a lot of energy to keep up with Roger Harmsworth and his program for the ZX81.





When you first run this program you will be presented with some brief instructions on how to play the game.

Briefly, however, you find yourself on the planet Zaphod, and your unenviable task is to search for a number of power cells required by Earth which is suffering from acute energy starvation. Once on the planet Zaphod, you make your way to the centre of the planet which is made of a room full of long corridors.

Power crazy

Once in the room you will see the power cells you are to collect – they are made up of inverse 'O' characters. Unforunately for you, there is a monster, called Tri Hex, which protects the caverns and will chase you around the corridors trying to stop you in your quest. Tri Hex is represented by a '£' character.

Once you have collected all the power cells, you must make your way to 'HOME' which is represented in the corridors by an inverse 'H' character. However, on your way round the corridors, you may find your way boxed in by Tri Hex or you may accidently press the wrong button and find yourself falling down a chute (which are represented by '■' characters. Should this happen, you will find yourself on one of the lower levels and you must find an elevator to get yourself up to the first level. An elevator is represented by an inverse 'E' character.

There is also the possibility of being evaporated, in which case you will suddenly find yourself on another planet called DX4. In this eventuality, you must find a shuttle, represented by an inverse 'S' character, an get yourself back to Zaphod and continue your search for power cells.

There is also a limit of time for you to get your power cells back to 'HOME' so don't waste any time! Movement around the corridors in the centre of Zaphod is made via the cursor keys on the ZX81.

Line by line

Here follows a breakdown of the program, should you wish to examine it more closely:

Lines 100-490	Provide instructions for the game.
Lines 492-625	Set up the screen display.
Lines 630-780	Move the monster, Tri Hex, and your own character, represented by an '*', while checking which square you have moved into each time you move.
Lines 1000-1010	The 'death' routine.
Lines 1020-1170	Ask you if you would like to play another game.
Lines 2000-2070	The routine controlling what happens if you reach 'HOME'.
Lines 3000-3020	The routine controlling what happens if the door of 'HOME' shuts on you before you have reached it.
Lines 4000-4130	Provide the inverse screen.
Lines 4140-4239	Provide information on the evaporator.
Lines 4240-4310	The routine controlling what happens if you reach the shuttle on the planet, DX4.
Lines 7000-7180	The routine controlling what happens if you fall down a chute on the first level of the corridors.
Lines 8000-8100	The routine controlling what happens if you manage to find an elevator on the lower level.
Lines 9000-9040	Draw up another map showing where you are.
Lines 9800-9860	The routine controlling what happens if you fall down too many chutes.
Lines 9900-9940	The routine controlling what happens if you are evaporated too many times.
Lines 9950-9970	The SAVE routine.

```
   2 LET H=0
   5 LET TI=240
  10 LET F=0
  15 LET C=0
  20 LET Y=0
  25 CLS
  30 LET G=0
  35 LET Z=0
 100 PRINT "D A N G E R   UXB"
 110 PRINT ,,"          YOU ARE GIVE
N INSTRUTIONS"
 120 PRINT ,,"TO GO TO THE PLANE
T ZAPHOD.USING"
 130 PRINT ,,"A PASS YOU ARE ABL
E TO BOARD THE"
 140 PRINT ,,"10.15 SHUTTLE TO J
UPITER."
 150 PRINT ,,"THERE YOU BOARD A
PRIVATE CRAFT"
 160 PRINT ,,"WHICH TRANSPORTS Y
OU TO ZAPHOD."
 170 PRINT ,,"LANDING IN A SECRE
T CAVERN YOU"
 180 PRINT ,,"ARE GIVEN INSTRUTI
ONS TO GO AND"
 190 PRINT ,,"RETREVE SOME HIGH
POWER CELLS."
 200 PRINT ,,"HIT A BUTTON"
 210 IF INKEY$="" THEN GOTO 210
 220 CLS
```

```
 230 PRINT "D A N G E R   UXE"
 240 PRINT ,,"THE CELLS WILL SAV
E THE PLANET "
 250 PRINT ,,"EARTH FROM ENERGY
STARVATION"
 260 PRINT ,,,,"BEGINING IN THE
CAVERN YOU WALK"
 270 PRINT ,,"DOWN A SMALL PASSA
GE UNTIL YOU"
 280 PRINT ,,"COME TO THE MIDDLE
OF THE PLANET"
 290 PRINT ,,"WHERE YOU START TO
LOOK FOR THE"
 300 PRINT ,,"POWER CELLS...GOOD
LUCK"
 310 PRINT ,,,,"HIT A BUTTON"
 320 IF INKEY$="" THEN GOTO 320
 340 CLS
 350 PRINT "D A N G E R   UXE"
 360 PRINT ,,,,"*  =  YOU"
 370 PRINT ,,"£  =  MONSTER"
 380 PRINT ,,"█  =  WALL"
 390 PRINT ,,"▣  =  POWER CELLS"
 395 PRINT ,,"▣  =  HOME"
 400 PRINT ,,,,"5  TO GO LEFT"
 410 PRINT ,,"8  TO GO RIGHT"
 420 PRINT ,,"6  TO GO SOUTH"
 430 PRINT ,,"7  TO GO NORTH";
 432 PRINT "   HIT A BUTTON"
 434 IF INKEY$="" THEN GOTO 434
 436 CLS
 438 PRINT "D A N G E R   UXE"
 439 PRINT ,,"▒  =  CHUTE"
 440 PRINT ,,"▣  =  ELEVATOR"
 441 PRINT ,,"▣  =  SHUTTLE"
 442 PRINT ,,"▣  =  EVAPERATER"
 445 PRINT ,,,,"I FORGOT...THERE
IS A MONSTER"
 450 PRINT ,,"CALLED TRI HEX KEE
P OUT OF HIS "
 460 PRINT ,,"WAY AT ALL COSTS
GOOD LUCK"
 470 PRINT ,,,,"HIT A BUTTON"
 480 IF INKEY$="" THEN GOTO 480
 490 CLS
 492 GOSUB 4000
 495 FAST
 510 LET ZZ=1+PEEK 16396+256*PEE
K 16397
 520 LET A=ZZ+67
 540 FOR D=0 TO 19
 550 PRINT AT D,0;"█ █ █ █ █ █ █ █
█ █ █ █ █ █ █ █ █"
 560 NEXT D
 570 PRINT AT 0,0;"████████████████
████████████████"
 580 PRINT AT 19,0;"███████████████
████████████████"
 585 PRINT AT 8,2;CHR$ 0;AT 18,4
;CHR$ 0;AT 16,6;CHR$ 0;AT 10,8;C
HR$ 0;AT 10,10;CHR$ 0;AT 13,12;C
HR$ 0;AT 2,14;CHR$ 0;AT 5,16;CHR
$ 0;AT 8,18;CHR$ 0;AT 4,20;CHR$
0;AT 17,22;CHR$ 0;AT 6,24;CHR$ 0
;AT 2,26;CHR$ 0;AT 7,28;CHR$ 0
 586 IF F=1 THEN GOTO 595
 587 FOR D=0 TO 10
 588 PRINT AT INT (RND*17)+1,INT
(RND*29)+1;CHR$ 180
 589 NEXT D
 590 FOR D=0 TO 4
 591 PRINT AT INT (RND*17)+1,INT
(RND*30)+1;CHR$ 136
 592 NEXT D
 593 PRINT AT 1,1;"H"
 594 PRINT AT INT (RND*17)+1,INT
(RND*30)+1;"█"
 595 FOR D=0 TO 25
 600 PRINT AT INT (RND*17)+1,INT
(RND*29)+1;CHR$ 0
 610 NEXT D
 620 LET B=(ZZ+36)
 621 LET T=B
 622 LET Q=0
 623 IF F=1 THEN GOTO 9000
 625 SLOW
 630 POKE A,23
 640 POKE B,12
 650 LET W=A
 652 LET R=B
 655 PRINT AT 21,0;"CELLS ";C;"
.TIME LEFT ";TI;"  "
 656 POKE A,0
 657 POKE B,0
 659 LET TI=TI-1
 660 LET A=A+(INKEY$="8")-(INKEY
$="5")
 665 IF TI<=0 THEN GOTO 3000
 670 IF INKEY$="6" THEN LET A=A+
33
 680 IF INKEY$="7" THEN LET A=A-
33
 690 IF PEEK (A)=128 THEN LET A=
W
 692 IF Q=0 THEN LET B=B+33
 694 IF Q=1 THEN LET B=B-33
 715 IF B<=T THEN LET Q=0
 720 IF B>T+(16*33) THEN LET Q=1
 750 POKE B,12
 760 IF PEEK (A)=12 THEN GOTO 10
00
 762 IF PEEK (A)=184 THEN GOTO 4
100
 765 IF PEEK (A)=173 THEN GOTO 2
000
 770 IF PEEK (A)=180 THEN LET C=
C+1
 772 IF PEEK (A)=139 THEN GOTO 4
100
 775 IF PEEK (A)=170 THEN GOTO 8
000
 777 IF PEEK (A)=136 THEN GOTO 7
000
 780 GOTO 630
1000 CLS
1001 PRINT AT 16,3;"███    ███
███  ███"
1002 PRINT AT 17,3;"█  █  █
█ █ █ █"
1003 PRINT AT 18,3;"█  █  ███
███ █ █"
1004 PRINT AT 19,3;"█  █  █
█ █ █ █"
1005 PRINT AT 20,3;"███    ███
█ ▪ ███"
1006 FOR D=0 TO 22
1007 FOR J=1 TO 2
1008 NEXT J
1009 SCROLL
1010 NEXT D
1020 CLS
1024 PRINT ,,,,"...CELLS RESCUED
";C
1025 IF PEEK 16507<=C THEN POKE
16507,C
1027 PRINT ,,"HIGH SCORE ";PEEK
16507
1028 FOR D=0 TO 100
1030 NEXT D
1032 IF H=1 THEN GOTO 490
1034 PRINT ,,"PLAY AGAIN ?"
1040 INPUT B$
1050 IF B$="Y" THEN RUN
1070 PRINT AT 16,7;"███   █  █
███"
1080 PRINT AT 17,7;"█  █  █  █
█"
1090 PRINT AT 18,7;"███   ███
███"
1100 PRINT AT 19,7;"█  █    █
█"
1110 PRINT AT 20,7;"███     █
███"
1120 FOR D=0 TO 22
1130 FOR J=1 TO 2
1140 NEXT J
1150 SCROLL
1160 NEXT D
```

```
1165 CLS
1170 STOP
2000 CLS
2010 PRINT "HOME.."
2020 PRINT ,,,,"THE PLANET EARTH
 IS GRATEFUL FOR "
2030 PRINT ,,"YOUR HELP    SCORE
";C
2040 IF C<7 THEN PRINT ,,"BUT YO
U HAVE NOT GOT ENOUGH"
2050 LET H=0
2055 IF C<7 THEN LET H=1
2060 IF C<7 THEN PRINT ,,"SO BAC
K YOU GO TO GET SOME MORE."
2070 GOTO 1025
3000 CLS
3010 PRINT "I,M AFRAID YOUR OUT
OF TIME"
3012 PRINT ,,"AND THE DOOR SHUT
ON YOU.."
3015 PRINT ,,"TRI HEX CHASED AND
 CAUGHT YOU"
3017 PRINT
3018 FOR D=0 TO 200
3019 NEXT D
3020 GOTO 1000
4000 LET M$="042 012 064 006 023
 043 035 126 254 118 032 003 016
 248 201 198 128 119 024 242"
4010 FAST
4020 FOR M=16514 TO 16533
4030 POKE M,VAL M$( TO 3)
4040 LET M$=M$(5 TO )
4050 NEXT M
4060 RETURN
4100 FOR M=1 TO 30
4110 RAND USR 16514
4115 NEXT M
4120 FOR D=0 TO 50
4130 NEXT D
4140 CLS
4142 IF G=1 THEN GOTO 4240
4145 LET G=1
4147 LET Y=Y+1
4148 IF Y>=8 THEN GOTO 9900
4150 PRINT "H I G H"
4160 PRINT ,,"P O W E R"
4170 PRINT ,,"E V A P E R A T E
R"
4180 PRINT ,,,,"THE EVAPERATER H
AS DROPPED YOU ON"
4190 PRINT ,,"A PLANET CALLED DX
4 , TIME IS "
4200 PRINT ,,"RUNNING LOW HURRY.
TRY AND GET "
4210 PRINT ,,"BACK TO ZAPHOD...G
O TO A SHUTTLE"
4215 PRINT ,,"THERE IS ALSO A MO
NSTER ON DX4"
4220 PRINT ,,"         GOOD LUCK"
4225 FOR D=0 TO 100
4227 NEXT D
4230 CLS
4235 LET Z=1
4237 LET F=1
4239 GOTO 490
4240 CLS
4255 PRINT "DONE IT ..."
4260 PRINT ,,,,"NOW YOU ARE BACK
 ON ZAPHOD YOU "
4270 PRINT ,,"CAN GET BACK TO GE
TTING MORE "
4280 PRINT ,,"CELLS     GOOD LUCK"
4290 LET TI=200
4300 LET G=0
4302 LET F=0
4305 LET Z=0
4307 FOR D=0 TO 100
4309 NEXT D
4310 GOTO 490
7000 CLS
7010 FOR D=0 TO 20
7020 PRINT "▒▒▒▒▒▒▒▒█ █▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒"
7030 NEXT D
7040 PRINT AT 1,12;"▒YOU▒HAVE▒FA
LLEN▒"
7050 PRINT AT 3,12;"▒DOWN▒A▒CHUT
E▒ON▒"
7060 PRINT AT 5,12;"▒TO▒THE▒NEXT
▒LEVEL"
7070 PRINT AT 7,12;"▒WHERE▒YOU▒W
ILL▒"
7080 PRINT AT 9,12;"▒HAVE▒TO▒FIN
D▒AN▒"
7090 PRINT AT 11,12;"▒ELEVATOR▒T
O▒GET▒"
7100 PRINT AT 13,12;"▒BACK▒UP▒TO
▒THE▒"
7110 PRINT AT 15,12;"▒FIRST▒LEVE
L..▒"
7120 PRINT AT 17,14;"▒GOOD▒LUCK"
7130 LET TI=200
7140 LET F=1
7145 LET Y=Y+1
7150 FOR D=0 TO 20
7160 PRINT AT D,9;CHR$ 23;AT D,9
;CHR$ 0
7170 NEXT D
7172 FOR D=1 TO 200
7174 NEXT D
7175 IF Y>=8 THEN GOTO 9800
7180 GOTO 490
8000 CLS
8010 FOR D=0 TO 20
8020 PRINT "▒▒▒▒▒▒▒▒█ █▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒"
8030 NEXT D
8040 PRINT AT 1,12;"▒DONE▒IT..▒N
OW▒"
8050 PRINT AT 3,12;"▒GOING▒BACK▒
UP▒TO▒"
8060 PRINT AT 5,12;"▒THE▒FIRST▒L
EVEL▒"
8070 PRINT AT 7,12;"▒▒▒▒GOOD▒LUC
K▒"
8080 LET TI=200
8090 LET F=0
8092 FOR D=20 TO 0 STEP -1
8093 PRINT AT D,9;CHR$ 23;AT D,9
;CHR$ 0
8094 NEXT D
8095 FOR D=1 TO 100
8096 NEXT D
8100 GOTO 490
9000 IF G=1 THEN GOTO 9030
9005 FOR D=1 TO 4
9010 PRINT AT INT (RND*17)+1,INT
 (RND*20)+10;CHR$ 170
9020 NEXT D
9025 IF G<>1 THEN GOTO 9040
9030 PRINT AT INT (RND*17)+1,INT
 (RND*30)+1;CHR$ 184
9040 GOTO 625
9800 CLS
9810 PRINT "BECAUSE YOU HAVE FAL
LEN DOWN TOO"
9820 PRINT ,,"MANY CHUTES..TRI H
EX CREPT DOWN"
9830 PRINT ,,"TO THE NEXT LEVEL
AND HID UNDER"
9840 PRINT ,,"THE CHUTE YOU CAME
 DOWN AND ATE"
9850 PRINT ,,"YOU"
9852 FOR D=0 TO 200
9854 NEXT D
9860 GOTO 1000
9900 CLS
9910 PRINT "BECAUSE YOU HAVE BEE
N EVAPERATED"
9920 PRINT ,,"TOO MANY TIMES YOU
R BODY "
9930 PRINT ,,"DISINTIGRATED UNDE
R THE STRAIN.."
9940 GOTO 9852
9950 CLEAR
9960 SAVE "DANGER UX█"
9970 RUN
```



It all
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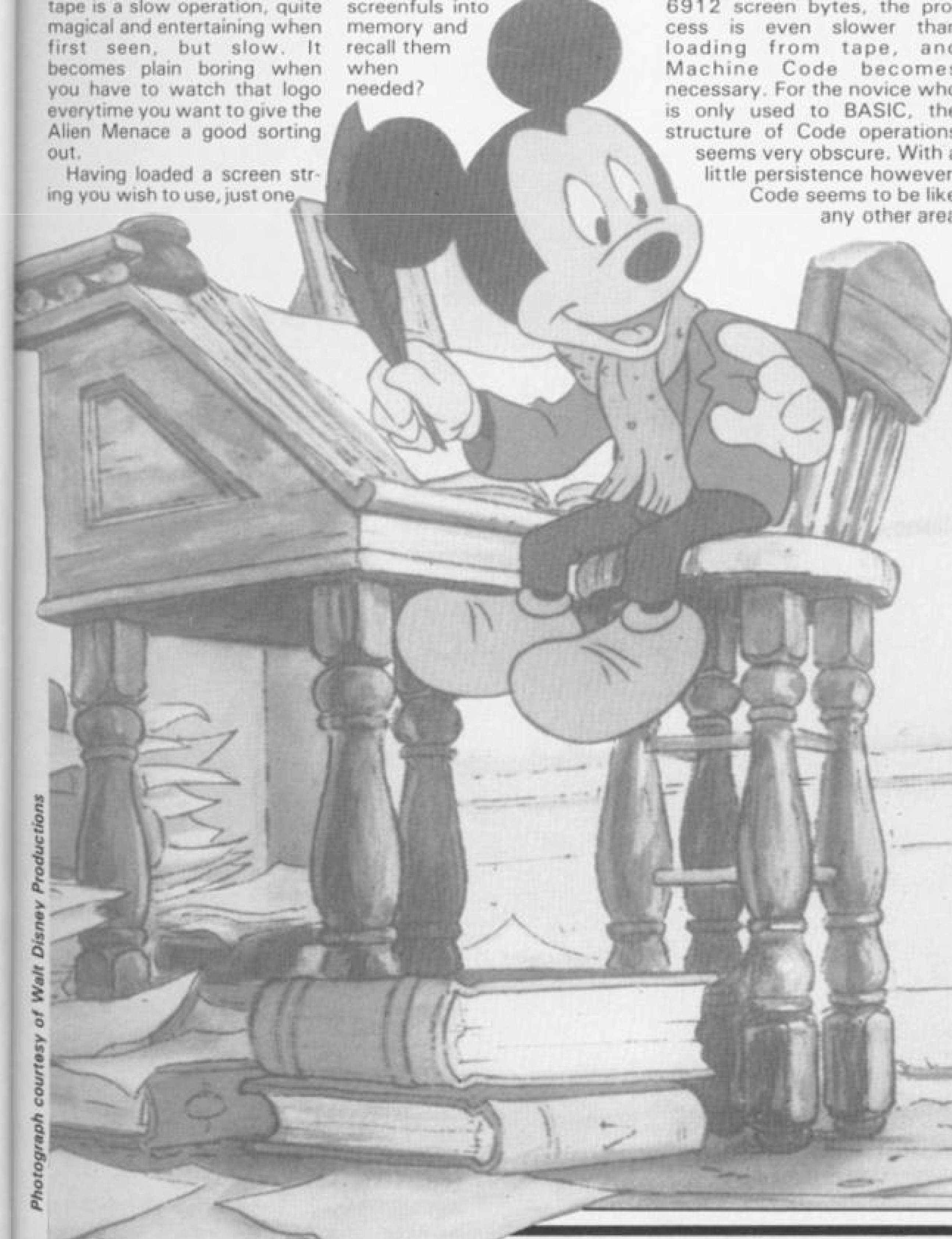
Photograph courtesy of Walt Disney Productions

Animation

Get things moving with Duncan Overton's grahics program.

It all began whilst watching some software company's logo reveal itself, stripe by stripe, on the TV screen. Loading a screen string from tape is a slow operation, quite magical and entertaining when first seen, but slow. It becomes plain boring when you have to watch that logo everytime you want to give the Alien Menace a good sorting out.

Having loaded a screen string you wish to use, just one misplaced finger and it's lost, needing retrieval from tape (where is that microdrive?). So why not invent a routine to shunt screenfuls into memory and recall them when needed?



Photograph courtesy of Walt Disney Productions

This is easy enough to do using PEEK and POKE, PEEKING bytes from address 16384 onwards and POKEing them into higher memory. As there are 6912 screen bytes, the process is even slower than loading from tape, and Machine Code becomes necessary. For the novice who is only used to BASIC, the structure of Code operations seems very obscure. With a little persistence however, Code seems to be like any other area of programming, easier to learn once you have a specific need to be met. Once the sequence of operations is properly visualised, trial and error will get you there in the end. One point soon learnt is that you must tape each program before you RUN it – in Code, crashes are invariably fatal!

There are over 40,000 bytes available on the 48K for program and storage space, so up to 5 screenfuls could be stored. Program 1 is a Code routine to move 6912 bytes from one starting address to another. In order that this routine can be used and modified easily, it may be entered from a DATA statement in BASIC. For this, it needs to be written in decimal form. Bytes 2,3 and 5,6 are the addresses, which are written in a manner illogical to common mortals. Byte 3 is the number of 256s in the address, and byte 2 is the remainder from this division. So address 33000 is 33000/256 which equals 128, remainder 232, and is enetred as 232, 128, which the little Z80 chip seems to understand perfectly.

Program 2 is a BASIC routine to enter and run the Code program using specified addresses. The Code is placed at the top end of memory, 64000 to 64020, and is preserved from NEW using line 1000. Screen strings can be stored as low as 25000 in memory provided only a small BASIC program is stored as well. The storage addresses increase by 7000 for each new entry. Enter and RUN the program, using addresses 16384 and 25000, and then set up a screen design. ENTER RANDOMIZE USR 64000, and nothing at all will appear to happen. But with the specified addresses, the screen is now copied into memory from 25000 to 31912 (PEEK it and see). Clear the screen and RUN the BASIC program again, entering address 25000 first and 16384 second. RANDOMIZE USR 64000 again

and your screenful will return, considerably more quickly than using PEEK and POKE. Four further screenfuls can be stored and retrieved in the same way.

So what has all this to do with animation? Well, if the code routine is used to recall screenfuls repeatedly in cycle, then interesting possibilities arise. Program 3 uses the Code routine, at line 100, to store 4 designs. These 4 designs are created in line 7 to 70, and are each slightly different. Lines 200 onwards recall these blocks in cycle continuously, and Hey Presto! you have an animated Spectrum.

For those of us used only to BASIC programming it is awe-inspiring to calculate that, as one revolution of the figures takes about 7 seconds, and involves 64 'frames', then some 63000 bytes are being shunted around each second!

Spinning wheels, wriggly caterpillars, travelling waves and rotating solids can all be produced in the same way.



Photograph courtesy of Walt Disney Productions

Program 1

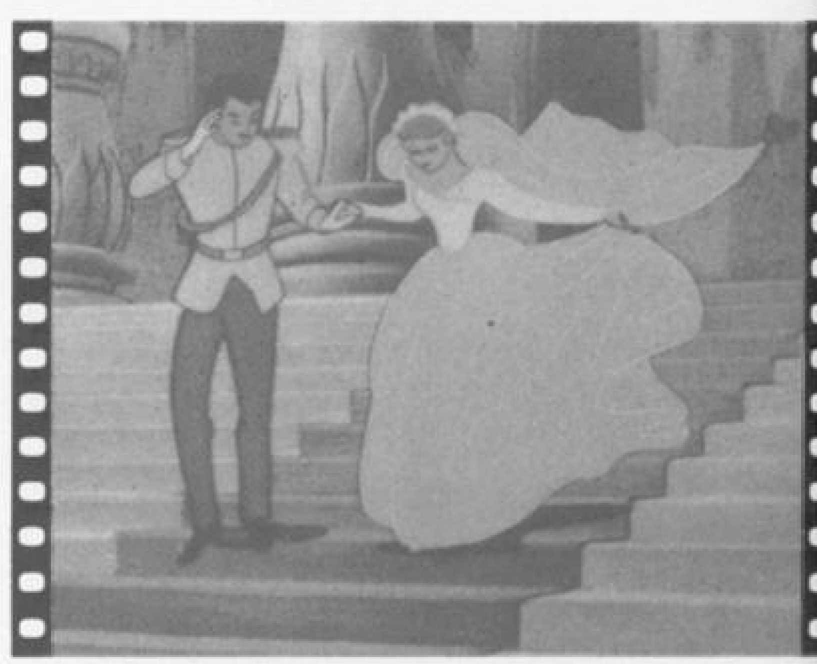
HEX	MNEMONICS	FOR HUMANS
II,XX,XX	LD DE, address I	Set 'read from' address
21,XX,XX	LD HL, address 2	Set 'load to' address
06,IB	LD B, 27	Set up a loop of
C5	PUSH BC	6912 repetitions
06,00	LD B,256	
IA	LD A, DE	Put contents of add. 1
77	LD(HL),A	into add. 2
13	INC DE	Move add. I & add. 2
23	INC HL	on to next address
IO,F9	DJNZ, −6	Other end of
CI	POP BC	loop
IO,F4	DJNZ, −II	
C9	RET	Return to BASIC

Program 2

```
1000 CLEAR 63999
1010 INPUT "'READ FROM' ADDRESS
? ";Y
1020 INPUT "'STORE TO' ADDRESS ?
";Z
1025 FOR N=64000 TO 64020
1030 READ A: POKE N,A: NEXT N
1035 DATA 17,Y-INT (Y/256)*256,I
NT (Y/256)
1040 DATA 33,Z-INT (Z/256)*256,I
NT (Z/256)
1045 DATA 6,27,197,6,0,26,119,19
,35,16,249,193,16,244,201
1050 PRINT "SET UP, OR RECALL SC
REEN NOW"
```

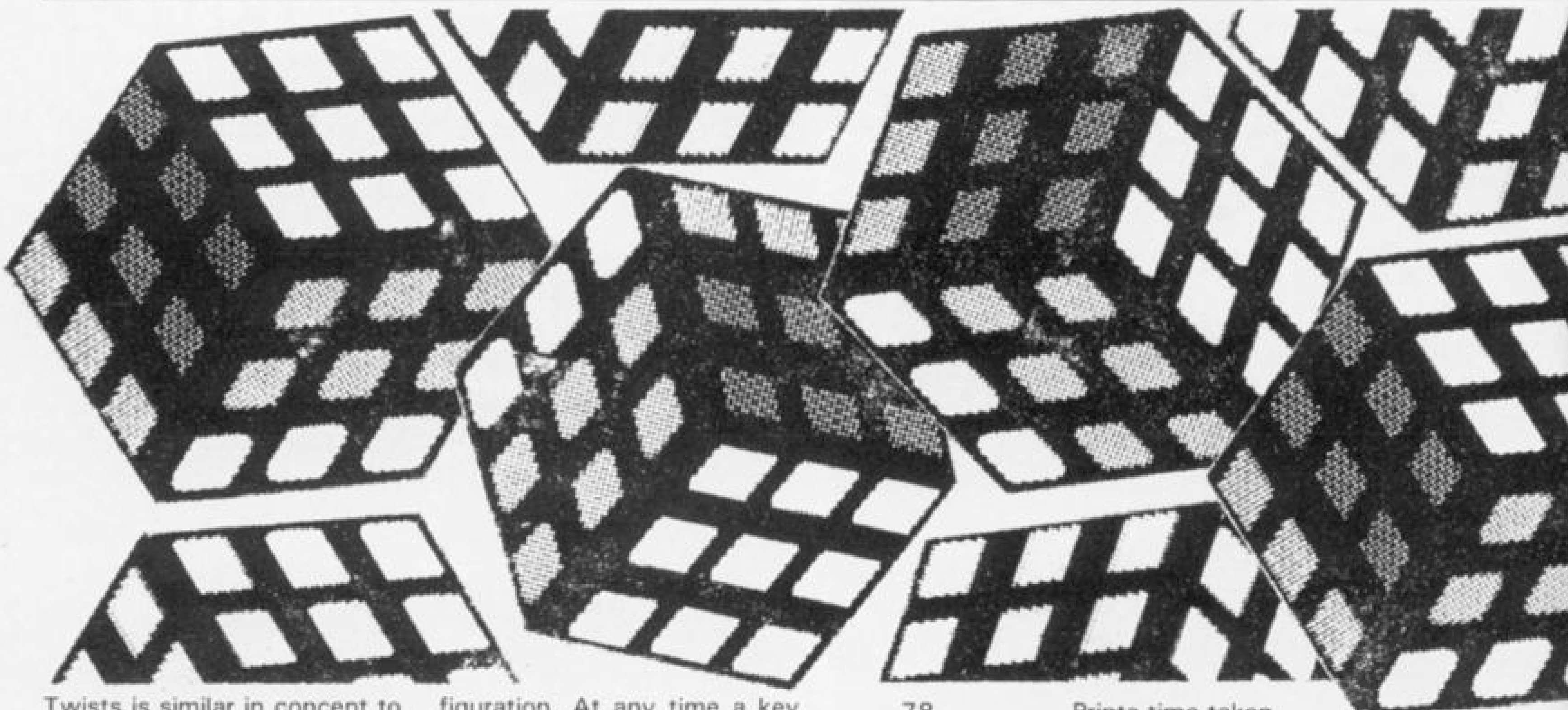
Program 3

```
   1 REM        STARSPIN
        © DGOverton 1983
   2 BORDER 0: PAPER 0: BRIGHT 1
: CLS
   3 OVER 0: CLEAR 63999
   5 LET z=26000: LET d=0
   7 FOR m=1 TO 4
  10 FOR n=0+d TO 2*PI+d STEP PI
/8
  15 INK 6: PLOT 127+127*SIN n,8
7+87*COS (n)
  16 INK 6: PLOT 127+127*SIN (n+
PI/100),87+87*COS (n+PI/100)
  17 INK 6: PLOT 127+127*SIN (n+
PI/50),87+87*COS (n+PI/50)
  18 INK 6: PLOT 127+127*SIN (n+
3*PI/100),87+87*COS (n+3*PI/100)
  22 INK 5: PLOT 127+70*SIN -n,8
7+70*COS -n
  25 DRAW 70*(SIN (-n+PI/2)-SIN
-n),70*(COS (-n+PI/2)-COS -n)
  26 INK 2: PLOT 127+35*SIN n,87
+35*COS n
  27 DRAW 35*(SIN (n+PI/2)-SIN n
),35*(COS (n+PI/2)-COS n)
  30 NEXT n
  35 GO SUB 100
  40 LET z=z+7000
  50 LET d=d+PI/32
  60 CLS
  70 NEXT m
  92 GO TO 200
 100 RESTORE 110: FOR n=64000 TO
 64020: READ q: POKE n,q: NEXT n
: RANDOMIZE USR 64000
 110 DATA 17,0,64,33,z-INT (z/25
6)*256,INT (z/256),6,27,197,6,0,
26,119,19,35,16,249,193,16,244,2
01
 120 RETURN
 200 LET z=26000
 205 FOR f=0 TO 60 STEP 20
 210 RESTORE 220: FOR n=64000+f
TO 64019+f: READ q: POKE n,q: NE
XT n
 220 DATA 17,z-INT (z/256)*256,I
NT (z/256),33,0,64,6,27,197,6,0,
26,119,19,35,16,249,193,16,244
 230 LET z=z+7000
 240 NEXT f
 250 POKE 64080,201
 300 IF INKEY$="" THEN RANDOMIZE
USR 64000
 302 IF INKEY$<>"" THEN GO TO 30
2
 304 GO TO 300
```



Twists Twists

A mind bending program from Paul Clansey of Liverpool.



Twists is similar in concept to Rubik's Cube, but with a two-dimensional, four-colour sixteen-square grid. The squares are shuffled randomly at the start of each game, the player then shifting one row or column at a time, attempting to return it to its original configuration. At any time a key may be pressed (Q) to check the solution — if it is correct then the time taken will be displayed in seconds. The keys used to manipulate the grid are indicated around its edges. The program is structured as follows:

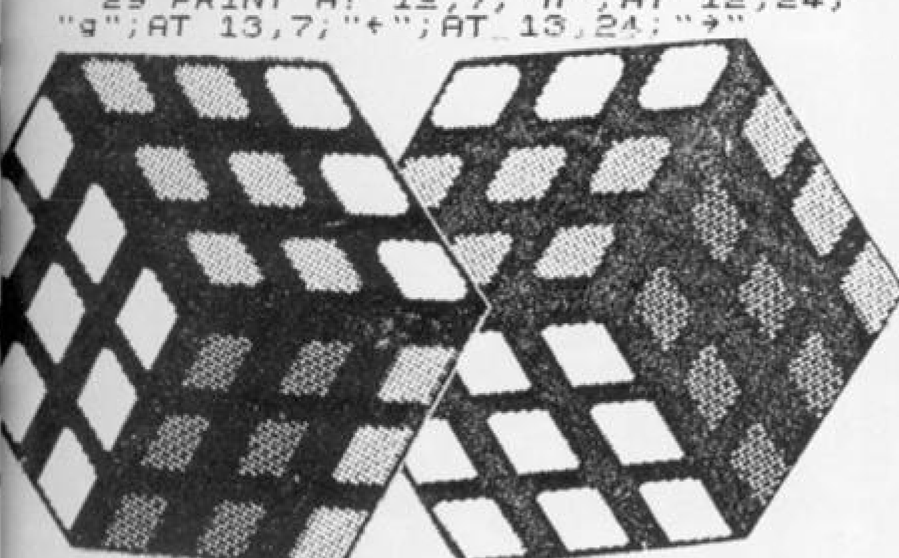
Line 1	REM statement of sufficient characters to hold the machine code routine.
2	POKEs data from lines 6 to 8 into above.
6-8	DATA for machine code routine which changes attributes within a 2 by 2 character square.
10	DATA for the attributes of the sixteen grid squares.
11-12	DATA for the USR Graphics (four arrows).
20	Sets up a two-dimensional array of the attribute values.
21-24	Sets up the USR Graphics (A = ↑ ; B = ↓ ; C = ←; D = →)
25-60	Sets up the screen display.
61-63	Awaits request for another game.
64	Random Shift Counter (RSC)
65	Decrements RSC and randomly goes to one of the 16 possible shifts.
70-71	Checks to see if Q is pressed.
72	Excludes unexpected INKEY$.
73	Goes to line number determined by the CODE of INKEY$.
75	(After Q is pressed) calculates time taken.
76-77	Checks that solution is correct — if not then goes to 80.
78	Prints time taken.
80-81	Informs of incomplete solution, then sets up correctly.
100-115	Each line performs one of the 16 possible shifts, each affecting four elements of the attribute array.
116	If in middle of game, goes to 120.
117	If performing random shifts, goes to 65.
118	If last random shift just executed, sets to the current time.
120	POKEs attribute value, and Line and Column number of the top left-hand character square in each of the sixteen grid squares into the machine code routine, executing each in turn.

Variable Names

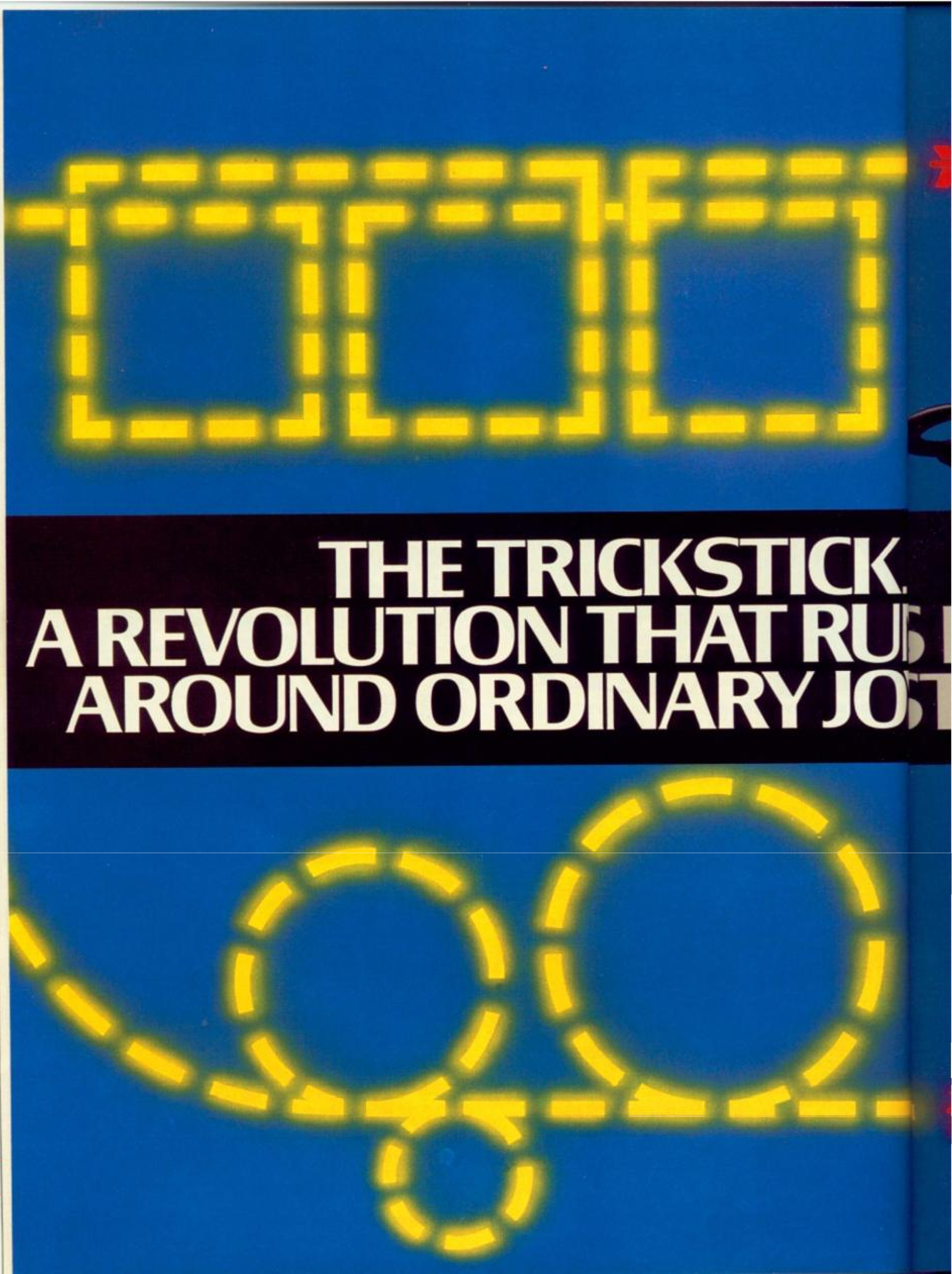
Array	a(x,y)	x and y from 1-4 are the grid row and column numbers. Elements of the array are Attribute values for each grid square.
	fg	Number of random shifts to be executed.
	t	Time in seconds.
	v	Temporary location for first array element in each shift execution.

```
   1 REM xxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
   2 FOR n=23760 TO 23803: READ
a: POKE n,a: NEXT n
   5 RANDOMIZE : DIM a(4,4)
   6 DATA 62,64,1,0,0,17,4,4,33,
223,67,213,17,32,0,4,25,16,253
   7 DATA 65,4,35,16,253,209,66,
229,72,67,119,35,16,252,225,213
   8 DATA 17,32,0,25,209,65,16,2
39,201
```

```
  10 DATA 16,16,48,48,16,16,48,4
8,32,32,8,8,32,32,8,8
  11 DATA 0,8,28,42,8,8,0,0,0,0,
8,8,42,28,8,0
  12 DATA 0,16,32,124,32,16,0,0,
0,8,4,62,4,8,0,0
  20 FOR y=1 TO 4: FOR x=1 TO 4:
 READ z: LET a(x,y)=z: NEXT x: N
EXT y
  21 FOR f=0 TO 7: READ z: POKE
USR "A"+f,z: NEXT f
  22 FOR f=0 TO 7: READ z: POKE
USR "B"+f,z: NEXT f
  23 FOR f=0 TO 7: READ z: POKE
USR "C"+f,z: NEXT f
  24 FOR f=0 TO 7: READ z: POKE
USR "D"+f,z: NEXT f
  25 BORDER 0: PAPER 5: CLS
  26 PRINT AT 2,9;"a↑  b↑  c↑  d
↑  ";AT 19,9;"l↓  k↓  j↓  i↓"
  27 PRINT AT 4,7;"p";AT 4,24;"e
";AT 5,7;"←";AT 5,24;"→"
  28 PRINT AT 8,7;"o";AT 8,24;"f
";AT 9,7;"←";AT 9,24;"→"
  29 PRINT AT 12,7;"n";AT 12,24;
"g";AT 13,7;"←";AT 13,24;"→"
```



```
  30 PRINT AT 16,7;"m";AT 16,24;
"h";AT 17,7;"←";AT 17,24;"→"
  31 FOR n=3 TO 10: PRINT PAPER
2;AT n,8;"        "; PAPER 6;"
        ": NEXT n: FOR m=11 TO 18:
 PRINT PAPER 4;AT m,8;"        "
; PAPER 1;"        ": NEXT m
  40 PLOT 64,151: DRAW 191-64,0:
 DRAW 0,24-151: DRAW 64-191,0: D
RAW 0,151-24
  50 PLOT 64,87: DRAW 191-64,0:
PLOT 64,55: DRAW 191-64,0: PLOT
64,238/2: DRAW 191-64,0
  55 PRINT AT 10,28; PAPER 2;" "
; PAPER 6;" ";AT 11,28; PAPER 4;
" "; PAPER 1;" "
  60 PLOT 127,151: DRAW 0,24-151
: PLOT 96,151: DRAW 0,24-151: PL
OT 159,151: DRAW 0,24-151
  61 PRINT AT 0,0;" PRESS ANY KE
Y TO PLAY."
  63 IF INKEY$="" THEN GO TO 62
  64 PRINT AT 0,0;"
                    ": LET fg=30
  65 LET fg=fg-1: GO TO INT (RND
*16+97)
  70 IF INKEY$="" THEN GO TO 69
  71 IF INKEY$="q" THEN GO TO 75
  72 IF CODE INKEY$<97 OR CODE I
NKEY$>112 THEN GO TO 70
  73 GO TO ((CODE INKEY$)+3)
  75 RESTORE 10: LET t=(256*256*
PEEK 23674+256*PEEK 23673+PEEK 2
3672)/50-t
  76 FOR y=1 TO 4: FOR x=1 TO 4:
 READ z: IF z<>a(x,y) THEN GO TO
 80
  77 NEXT x: NEXT y
  78 PRINT AT 21,0;"
                    ": PRINT FLA
SH 1;AT 21,10;"TIME: ";t: GO TO
61
  80 PRINT AT 21,0;"
                    ": PRINT FLA
SH 1;AT 21,10;"INCOMPLETE"
  81 FOR n=1 TO 700: NEXT n: RES
TORE 10: GO TO 20
 100 LET v=a(1,1): LET a(1,1)=a(
1,2): LET a(1,2)=a(1,3): LET a(1
,3)=a(1,4): LET a(1,4)=v: GO TO
116
 101 LET v=a(2,1): LET a(2,1)=a(
2,2): LET a(2,2)=a(2,3): LET a(2
,3)=a(2,4): LET a(2,4)=v: GO TO
116
 102 LET v=a(3,1): LET a(3,1)=a(
3,2): LET a(3,2)=a(3,3): LET a(3
,3)=a(3,4): LET a(3,4)=v: GO TO
116
 103 LET v=a(4,1): LET a(4,1)=a(
4,2): LET a(4,2)=a(4,3): LET a(4
,3)=a(4,4): LET a(4,4)=v: GO TO
116
 104 LET v=a(4,1): LET a(4,1)=a(
3,1): LET a(3,1)=a(2,1): LET a(2
,1)=a(1,1): LET a(1,1)=v: GO TO
116
 105 LET v=a(4,2): LET a(4,2)=a(
3,2): LET a(3,2)=a(2,2): LET a(2
,2)=a(1,2): LET a(1,2)=v: GO TO
116
 106 LET v=a(4,3): LET a(4,3)=a(
3,3) LET a(3,3)=a(2,3): LET a(2
,3)=a(1,3): LET a(1,3)=v: GO TO
116
 107 LET v=a(4,4): LET a(4,4)=a(
3,4): LET a(3,4)=a(2,4): LET a(2
,4)=a(1,4): LET a(1,4)=v: GO TO
116
 108 LET v=a(4,4): LET a(4,4)=a(
4,3): LET a(4,3)=a(4,2): LET a(4
,2)=a(4,1): LET a(4,1)=v: GO TO
116
 109 LET v=a(3,4): LET a(3,4)=a(
3,3): LET a(3,3)=a(3,2): LET a(3
,2)=a(3,1): LET a(3,1)=v: GO TO
116
 110 LET v=a(2,4): LET a(2,4)=a(
2,3): LET a(2,3)=a(2,2): LET a(2
,2)=a(2,1): LET a(2,1)=v: GO TO
116
 111 LET v=a(1,4): LET a(1,4)=a(
1,3): LET a(1,3)=a(1,2): LET a(1
,2)=a(1,1): LET a(1,1)=v: GO TO
116
 112 LET v=a(1,4): LET a(1,4)=a(
2,4): LET a(2,4)=a(3,4): LET a(3
,4)=a(4,4): LET a(4,4)=v: GO TO
116
 113 LET v=a(1,3): LET a(1,3)=a(
2,3): LET a(2,3)=a(3,3): LET a(3
,3)=a(4,3): LET a(4,3)=v: GO TO
116
 114 LET v=a(1,2): LET a(1,2)=a(
2,2): LET a(2,2)=a(3,2): LET a(3
,2)=a(4,2): LET a(4,2)=v: GO TO
116
 115 LET v=a(1,1): LET a(1,1)=a(
2,1): LET a(2,1)=a(3,1): LET a(3
,1)=a(4,1): LET a(4,1)=v: GO TO
116
 116 IF fg=0 THEN GO TO 120
 117 IF fg>1 THEN GO TO 65
 118 LET fg=0: PRINT AT 21,0;" P
ress 'Q' to stop clock.": LET t=
(256*256*PEEK 23674+256*PEEK 236
73+PEEK 23672)/50
 120 FOR y=1 TO 4: FOR x=1 TO 4:
 POKE 23761,a(x,y): POKE 23763,8
+4*(x-1): POKE 23764,3+4*(y-1):
 LET q=USR 23760: NEXT x: NEXT y
 125 GO TO 70
```


THE TRICKSTICK.
A REVOLUTION THAT RU
AROUND ORDINARY JO

TRICKSTICK TURNS YOUR SPECTRUM INTO THE MOST SOPHISTICATED GAMES MACHINE IN THE WORLD

Why is Trickstick superior to all other joystick systems?

PROPORTIONAL: A brilliant innovation in the circuitry of the interface gives proportional control (ie varying speeds and rates of turn) even with many non-proportional games. The design tears up the textbooks on conventional analogue to digital conversion and brings you unprecedented control and versatility.

ONE TO EIGHT PLAYERS: Innovative design also enables you to put up to eight Tricksticks on a single Spectrum. Each Trickstick comes with its own interface and the interfaces simply plug into each other. So games playing need no longer be a solitary occupation, and the kids won't have to fight for their turn any more.

SOFTWARE COMPATIBLE: Trickstick is compatible with any software which will work with the old-fashioned Kempston joystick.

PROGRAMMABLE: A low cost adaptor performs the technically simple job of making the Trickstick programmable, and compatible with ANY software.

NO MOVING PARTS: Small plastic-coated metal pads on the Trickstick detect how hard you are pressing by picking up electrical radiation from your fingers. This is then amplified and fed into the interface. So there are no moving parts at all;—not even the fire buttons. This arrangement was proved in competitive trials to give the greatest control and potential for spectacular skill.



And this makes Trickstick the only games system which does not wear out with heavy use!

ATTAKTICS: Trickstick gives new life to your existing software. Attaktics takes you and your Trickstick to new dimensions where skill and strategy are as important as the fast reactions of the very young. The game is very, very efficiently written in machine code and allows you to move in 64 different directions on the screen, giving perfectly smooth curves. Combine this with your new-found control of speed and rate of turn and imagine aerial combat against your Spectrum or against other Trickstick owners!

USE THE COUPON OR THE PHONE: Trickstick and Attaktics are in stock and available now. Trickstick including interface is £28. Attaktics is £7.50 if ordered with a Trickstick and £10 on its own. The Programmable Adaptor is £10 for Trickstick owners and £15 for others. The Training Tape is Free with each Trickstick. Or call us for the name of your local stockist.

Please send me:– [ ] Trickstick(s) with training cassette at £28 each £______
[ ] Attaktics at £7.50 (with each Trickstick) or £10 (on its own) £______
[ ] Programmable adaptor(s) at £10 (for Trickstick owners) or £15 (for others) £______
Postage 65p. I enclose Cheque/P.O. for £______ made payable to East London Robotics Ltd.
My Access / Visa is [ ]
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Please send to: East London Robotics Ltd., Gate 11, Royal Albert Dock, London E16. 24 Hour information service: 01-471 3308. 24 Hour Access/Visa ordering: 01-474 4715. Special enquiries: 01-474 4430 (Telex: 8813271). Same day despatch to phoned Access or Visa orders.

EAST LONDON ROBOTICS

ZX81 GAME

Asteroid adventure

Suspense in space with Roger Ditchburn of Whitby and his ZX81.



This program for your ZX81 is divided into three parts, Asteroid Storm, the Tunnel and lastly, the Hall of Fame.

The first section (giving away a lot in its title) Asteroid Storm, places you in a space ship in the middle of an asteroid storm trying to shoot at a space ship travelling from the top to the bottom of the screen. You move your own ship with the '5' and '8' keys to move left and right respectively; you can fire at the ship using the 'F' key.

A light touch on the keys will move your ship only one square at a time, whilst if you press hard the ship will move two squares at a time — so be careful!

And the rest . . .

The second part of the program involves your ship travelling through a tunnel with a gate at the end. Your task is to enter the gate — but you must make sure that your ship does not collide with any of the black squares surrounding the gate. You get to move your ship up and down using the '6' and '7' keys respectively. If you manage to get a good score on the first section, you may find that the gate becomes smaller and so your task is that bit harder.

The final part of the program is the Hall of Fame. This prints the top ten scores with the names of the people who scored them (the names must be less than ten letters long). The names are, of course, listed so that the highest scores are at the top of the list.

Good luck — you'll need it.

```
   3 DIM Z$(10,10)
   4 DIM Z(10)
   5 FOR F=1 TO 10
   6 LET Z$(F)="----------"
   7 LET Z(F)=0
   9 NEXT F
  12 LET SC=100
  20 LET A$="▒"
  30 LET DA=5
  50 LET B$="+"
  80 LET R=INT (RND*30)+1
  90 PRINT "ASTEROID STORM"
 100 FOR F=1 TO 21
 200 PRINT AT F,R;A$
 210 PRINT AT F-1,R;" "
 250 PRINT AT 20,DA;B$
 255 PRINT AT 20,DA;" "
 260 LET DA=DA+(INKEY$="8")-(INK
EY$="5")
 380 LET DA=DA+(INKEY$="8")-(INK
EY$="5")
 400 PRINT AT 20,DA;B$
 450 IF R=DA AND INKEY$="F" THEN
 GOTO 600
 500 NEXT F
 505 LET SC=SC-20
 510 PRINT AT 0,0;"YOU""RE DEAD-
TRY AGAIN"
 515 IF SC<=0 THEN GOTO 1100
 520 CLS
 530 GOTO 30
 600 FOR V=20 TO F STEP -1
 602 PRINT AT V,R;":"
 603 NEXT V
 604 PRINT AT V,R;"<>"
 605 FOR D=0 TO 21
 606 PRINT AT D,0;"
                    "
 607 NEXT D
 612 LET SC=SC+100
 614 PRINT AT 0,18;"SCORE= ";SC
 615 REM **TUNNEL**
 620 LET W=PEEK 16396+256*PEEK 1
6397+1
 630 FOR F=21 TO 0 STEP -1
 640 PRINT AT F,0;"██████████████
████████████████████"
 650 NEXT F
 651 FOR F=10 TO 14
 652 PRINT AT F,0;"▒
                    █"
 653 NEXT F
 655 PRINT AT 14,INT (RND*5)+10;
CHR$ 128
 657 PRINT AT 13,INT (RND*5)+15;
CHR$ 128
 660 LET RRR=INT (RND+21)
 670 LET RRRR=INT (RND*4)+10
 690 FOR F=1 TO SC/200
 692 LET R=INT (RND*25)+2
 694 LET RR=INT (RND*4)+10
 696 PRINT AT RR,R;CHR$ 128
 697 IF RR=RRRR THEN PRINT AT RR
,RRR;" "
 698 PRINT AT RRRR,RRR;"██"
 699 POKE W+495+RR,128
 705 PRINT AT RR+1,R;CHR$ 128
 708 PRINT AT RR-1,R+INT (RND*3)
;"██"
 710 NEXT F
 711 PRINT AT 13,1;"           ██";AT
 11,7;"  "
 715 PRINT AT 12,29;"▒";AT 13,29
;"▒"
 717 IF SC>1000 THEN PRINT AT 13
,29;"█"
 720 LET M=W+431
 730 IF PEEK M<>0 THEN GOTO 1000
 740 POKE M,CODE B$
 745 POKE M-1,0
 750 LET M=M+1
 800 LET M=M+33*(INKEY$="6")-33*
(INKEY$="7")
 890 LET SC=SC+1
 900 GOTO 725
 999 IF PEEK M<>CODE "▒" THEN GO
TO 1100
1004 IF SC<=0 THEN GOTO 9980
1005 IF PEEK M<>CODE "▒" THEN GO
TO 1100
1007 NEXT D
1015 LET SC=SC+150
1016 FOR F=10 TO 14
1017 PRINT AT F,0;"▒
                   █"
1018 NEXT F
1019 GOTO 660
1020 PRINT AT 20,0;" SCORE= ";SC
;"    "
1030 FOR F=1 TO 75
1040 NEXT F
1100 REM **HALL OF FAME**
1101 FOR D=1 TO 10
1102 POKE M,CODE B$
1103 POKE M,CODE "▒"
1106 NEXT D
1109 FOR F=1 TO 21
1110 PRINT AT F,0;"
                    "
1120 NEXT F
1125 PRINT AT 0,13;"SCORE=";SC
1130 IF SC>Z(10) THEN GOSUB 2000
1140 PRINT AT 3,0;"  THE HALL OF
                FAME"
1150 FOR F=1 TO 10
1160 PRINT AT F+5,2;Z$(F);AT F+5
,13;Z(F)
1170 NEXT F
1178 IF INKEY$="" THEN GOTO 1178
1179 CLS
1180 LET SC=100
1181 GOTO 20
2010 PRINT AT 0,0;"     YOUR SCOR
E IS IN THE TOP TEN"
2020 PRINT "WELCOME TO THE HALL
OF FAME"
2030 FOR F=1 TO 10
2040 IF SC>Z(F) THEN GOTO 2100
2050 NEXT F
2100 PRINT " INPUT YOUR NAME"
2200 FOR N=10 TO F+1 STEP -1
2210 LET Z$(N)=Z$(N-1)
2220 LET Z(N)=Z(N-1)
2250 NEXT N
2251 INPUT Z$(F)
2260 LET Z(F)=SC
5000 RETURN
6020 NEXT F
```

A New Dimension in Spectrum Hardware

Joystick and Interface

for Sinclair Spectrum with these features to give you endless hours of enjoyment.

1. Super positive response fire button.
2. Firm suction cups for stable one hand operation.
3. Snug fit hand moulded grip.
4. Additional fire button.
5. Extra long 4 ft lead.

The interface supplied with the Quick Shot (TM) has a two joysticks facility.

The first port simulates 6789 & 0 keys. The second port simulates in (31) command. It will run any Software.

1. Using keys 6, 7, 8, 9 and 0.
2. Having redifinable key function.
3. Using in (31) i.e. Kempston.
4. Any Software you write yourself.



£22.95

Light pen

The LIGHT PEN enables you to produce high resolution drawings on your own TV screen simply by plugging into the ear socket of your Spectrum. The controlling software supplied with the light pen has 16 pre-defined instructions. You can change colour (Border, Paper, Ink), draw circles, arcs, boxes, lines and insert text onto the screen at any chosen place, you can also draw freehand. There is a feature to retain the screens and animate. On the 48K Spectrum you can retain 5 screens. You can also use the machine code on its own in your own programs, for selecting out of a menu etc. The LIGHT PEN is supplied with a control interface, to adjust the sensitivity/pen alignment.

£19.95



Keyboard for use with a Spectrum or ZX81

£45.00

Our cased keyboard has 52 keys, 12 of which form a numeric pad. The 12 keys comprise 1-9 numeric plus full stop and shift keys, all in red, to distinguish from the main keyboard keys which are in grey, the keys contrast with the black case to form a very attractive unit. The case has been designed to take a ZX81 or Spectrum computer. 16K, 32K or 64K can also be fitted to the motherboard inside the case (81 model only). The case is also large enough for other add-ons like the power supply to be fitted, giving a very smart self-contained unit with which other add-ons e.g. printer etc. can still be used. Our ZX Professional keyboard offers more keys and features than any other model in its price range making it the best value keyboard available.



Spectra-Sound

The so-called speaker in your Spectrum is really on a 'buzzer'. With the DK Tronics "SPECTRA SOUND" you can generate fully amplified sound through the speaker on your TV set. SPECTRA SOUND is a very simple but highly effective add-on. This means that you no longer have a faint beep but a highly amplified sound, which can be adjusted with the TV volume control. The SPECTRA SOUND fits compactly and neatly inside the Spectrum case and is connected by three small crocodile clips.

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Name ....

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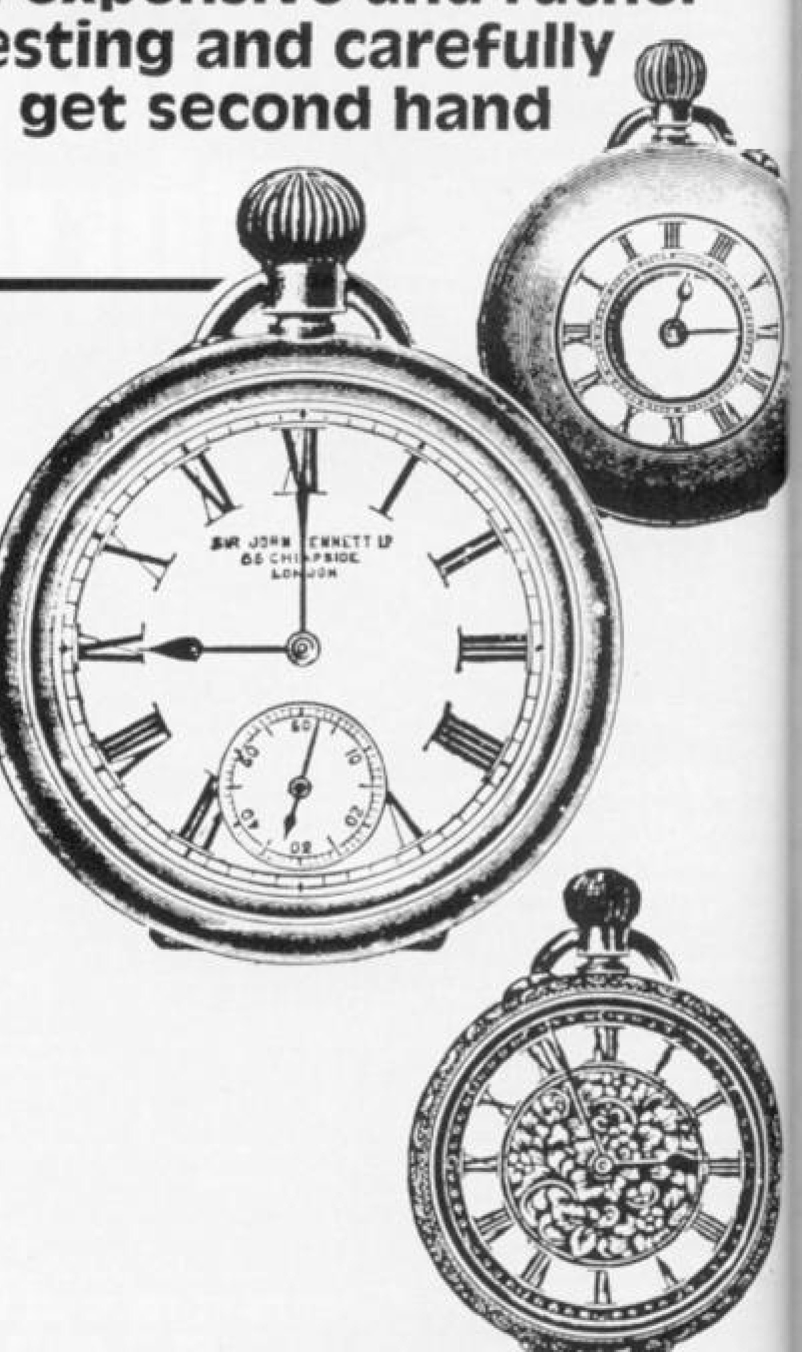
Send to: DK Tronics Ltd., Unit 6, Shire Hill Ind. Est., Saffron Walden, Essex CB11 3AQ. Tel: (0799) 26350 (24 hrs) 5 lines

dk'tronics

DK Tronics Ltd., Unit 6, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ.
Telephone: (0799) 26350 (24 hrs) 5 lines

Time out

Turn your Spectrum into an expensive and rather bulky wristwatch. An interesting and carefully designed program that you get second hand from Douglas Richardson of Edinburgh.



Chapter 18 of the Spectrum manual describes two analogue clock programs: the first version uses PAUSE as the 'hairspring' but, as the manual says, there is a difference of 1/50 between consecutive PAUSE numbers equivalent to half an hour per day. By altering the PAUSE valve you could probably increase the accuracy.

This program prints out a digital watch and, as the result is displayed as a number, setting and synchronising are much easier — the PAUSE is compounded to give this accuracy. The performance of the watch then is dependent more on the stability of the timing delay function on the computer, rather than the ultimate accuracy of the internal clock.

The PAUSE at line 110 is the main reference, it allows a slight gain which is essential if a following PAUSE is to be corrective.

Calibration

With PAUSE 49 at line 110 and REMs at 135 and 153, (see setting) run the watch for one hour. Seconds gained per hour times 5/6 rounded to the nearest integer gives you the PAUSE to be entered at line 135 in place of the REM. You must round down if you intend to use a third PAUSE for maximum accuracy. In the author's first check the gain was five seconds per hour:

5 x 5/6 = 4.16667

PAUSE 4 was then used at line 135.

```
  7 REM ***DIGITAL WRIST WATCH
 10 REM ***********************
 15 REM            D.Richardson
 20 REM ***********************
 30 GO SUB 250
 39 REM ***********************
 40 REM                Set time
 41 REM _______________________
 45 IF  INKEY$  <> "" THEN  GO TO 45
 50 IF  INKEY$ ="" THEN  GO TO 50
 55 IF  INKEY$ ="h" THEN  PRINT  AT 10,17;h+1: LET h=h+1: IF h>12 THEN  LET h=1
: PRINT h$;"1 ": GO TO 45
 60 IF  INKEY$ ="m" THEN  PRINT m$;m+1: LET m=m+1: IF m>59 THEN  LET m=0: PRINT
 m$;"0 ": GO TO 45
 65 IF  INKEY$ ="s" THEN  PRINT s$;s+5: LET s=s+5: IF s>59 THEN  LET s=0: PRINT
 s$;"0 ": GO TO 45
 70 IF  INKEY$ ="p" THEN  LET r$="PM": PRINT a$;r$: GO TO 45
 75 IF  INKEY$ ="a" THEN  LET r$="AM": PRINT a$;r$: GO TO 45
 80 IF  INKEY$  <> "g" THEN  GO TO 45
 85 FOR n=0 TO 11: PRINT  AT n,0;"                        ": NEXT n
 90 PRINT  AT 15,2;"As ""TIME""": PRINT  AT 16,5;"goes by"
 99 REM ***********************
100 REM              Clockworks              _______________________
```

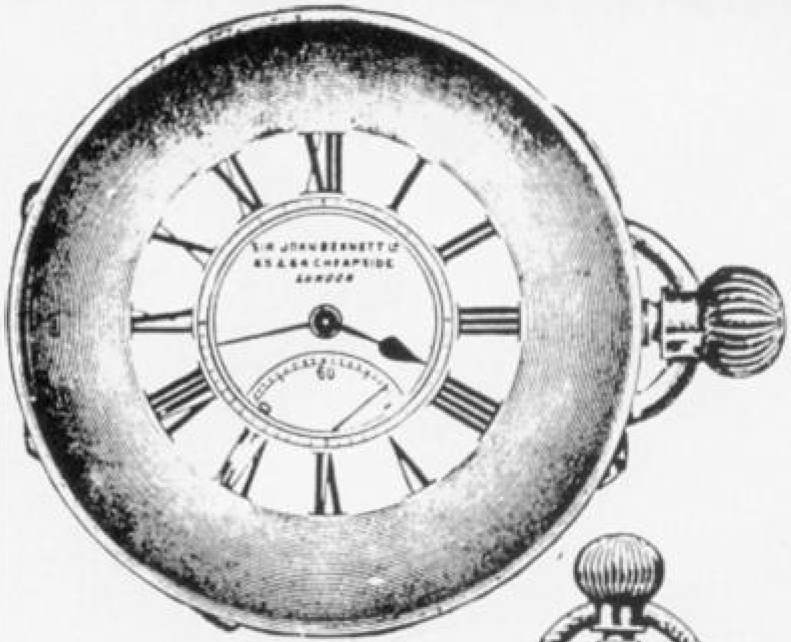
If you opt for maximum precision then with PAUSEs entered at lines 110 and 135, and a REM at line 153, run the clock over a much greater length of time. Seconds gained per hour x50 will give you the PAUSE value to be entered.

Looking back to the author's example, the third PAUSE was not necessary as the error was only two minutes per day with one PAUSE, and 4.8 seconds per day with two PAUSEs. However, your Spectrum may be different and require this fine tuning.

Subject to stability, the target accuracy should be 24/50 seconds per 24 hours. This would give you an error of one minute per 500 days!

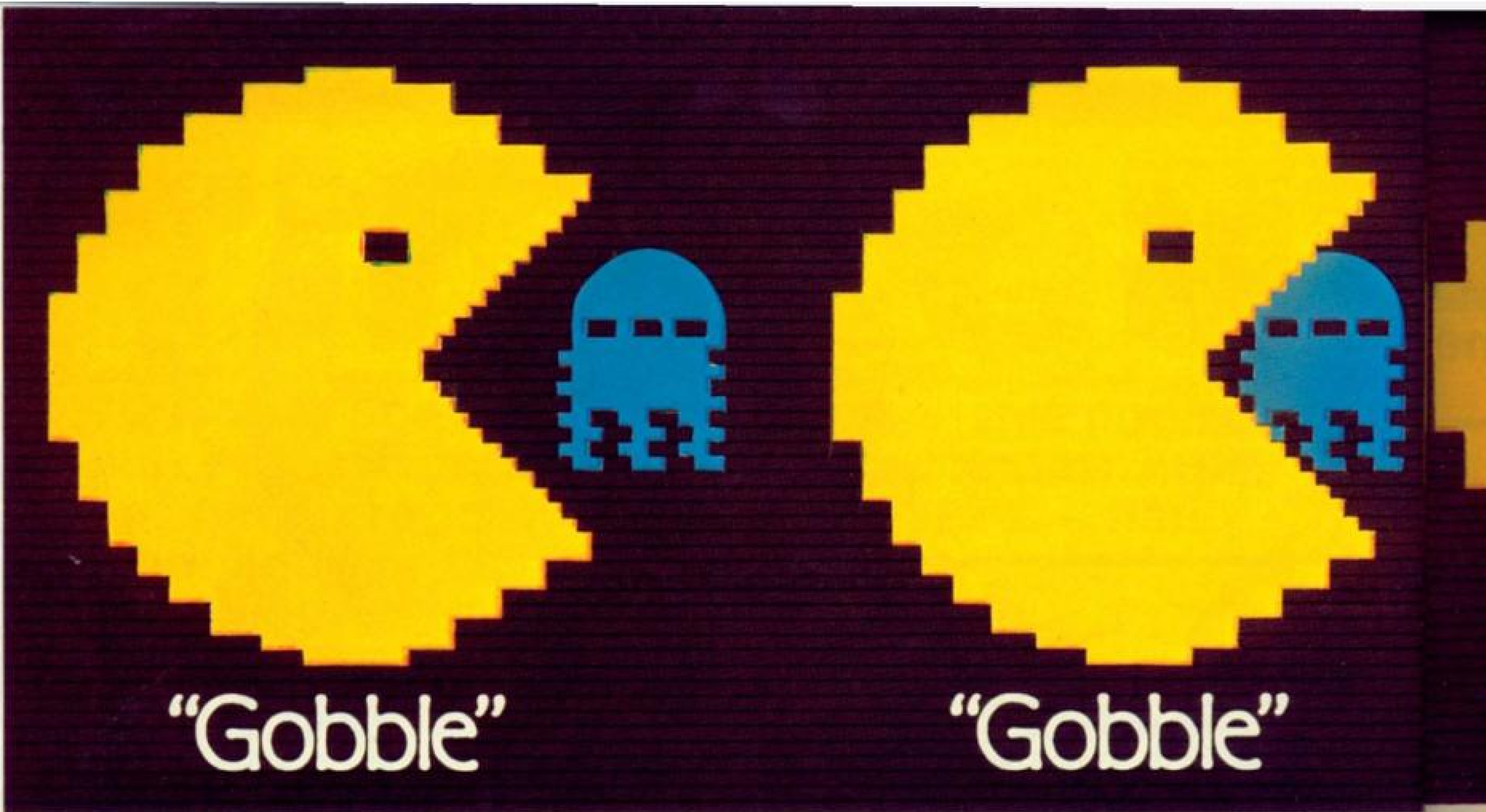
Setting

For ease of setting, the seconds increment by five, but run normally once set. Set the time with the seconds just ahead of real time then press G when the time is correct. Note: line 730 Graphics is "1". Date is for effect only and may be changed at line 400.





```
110 PAUSE 49
120 LET s=s+1
130 IF s<60 THEN  PRINT s$;s: GO TO 110
135 REM ANOTHER PAUSE? SEE TEXT
140 LET s=0: PRINT s$;"0 "
145 LET m=m+1: IF m<60 THEN  PRINT m$;m: GO TO 110
153 REM FURTHER PAUSE? SEE TEXT
155 LET m=0: PRINT m$;"0 "
160 LET h=h+1: IF h<12 THEN  PRINT h$;h: GO TO 110
165 IF h=12 THEN  PRINT h$;h: GO TO 195
170 IF h=13 THEN  LET h=0: PRINT h$;" 1": GO TO 110
195 IF r$="AM" THEN  LET r$="PM": PRINT a$;r$: GO TO 110
200 IF r$="PM" THEN  LET r$="AM": PRINT a$;r$: GO TO 110
244 REM **********************
245 REM                Build Watch
250 LET h=0: LET m=0: LET s=0
255 BORDER 0
260 LET h$= CHR$ 22+ CHR$ 10+ CHR$ 17
270 LET m$= CHR$ 22+ CHR$ 10+ CHR$ 20
280 LET s$= CHR$ 22+ CHR$ 10+ CHR$ 23
285 PRINT h$;h,m$;m,s$;s
290 LET r$="AM"
295 LET a$= CHR$ 22+ CHR$ 14+ CHR$ 17: PRINT a$;r$
300 PRINT  AT 0,0;"To set PRESS": PRINT " H for hours": PRINT " M  -  mins": PR
INT " S  -  secs": PRINT " AorP-AM/PM": PRINT '"   To START": PRINT "   PRESS 'G
'": PRINT ''" (Stopwatch": PRINT "    only""G"")"
350 PRINT  AT 12,17;"Hr"; AT 12,20;"Mn"; AT 12,23;"Sc"
400 PRINT  AT 14,21;"SA19"
500 PRINT  AT 7,18;"ASEIKO"
510 PRINT  AT 16,18;"Quartz"
520 PLOT 143,128: DRAW 0,-97,.72* PI
530 PLOT 192,31: DRAW 0,97,.72* PI
540 PLOT 143,175: DRAW 0,-51: DRAW 0,-89,.67* PI : DRAW 0,-35
550 PLOT 192,0: DRAW 0,35: DRAW 0,89,.67* PI : DRAW 0,51
560 FOR y=0 TO 35 STEP 5: PLOT 143,y: DRAW 49,0: NEXT y
570 FOR y=124 TO 175 STEP 5: PLOT 143,y: DRAW 49,0: NEXT y
580 PLOT 203,99: DRAW 0,-15: DRAW -71,0: DRAW 0,15: DRAW 71,0
590 PLOT 128,105: DRAW 79,0: DRAW 0,-51: DRAW -79,0: DRAW 0,51
700 FOR n=0 TO 7
710 READ a
720 POKE  USR "1"+n,a: NEXT n
730 PRINT  AT 12,28;"L"
740 RETURN
750 DATA 248,8,8,248,0,0,0,0
```



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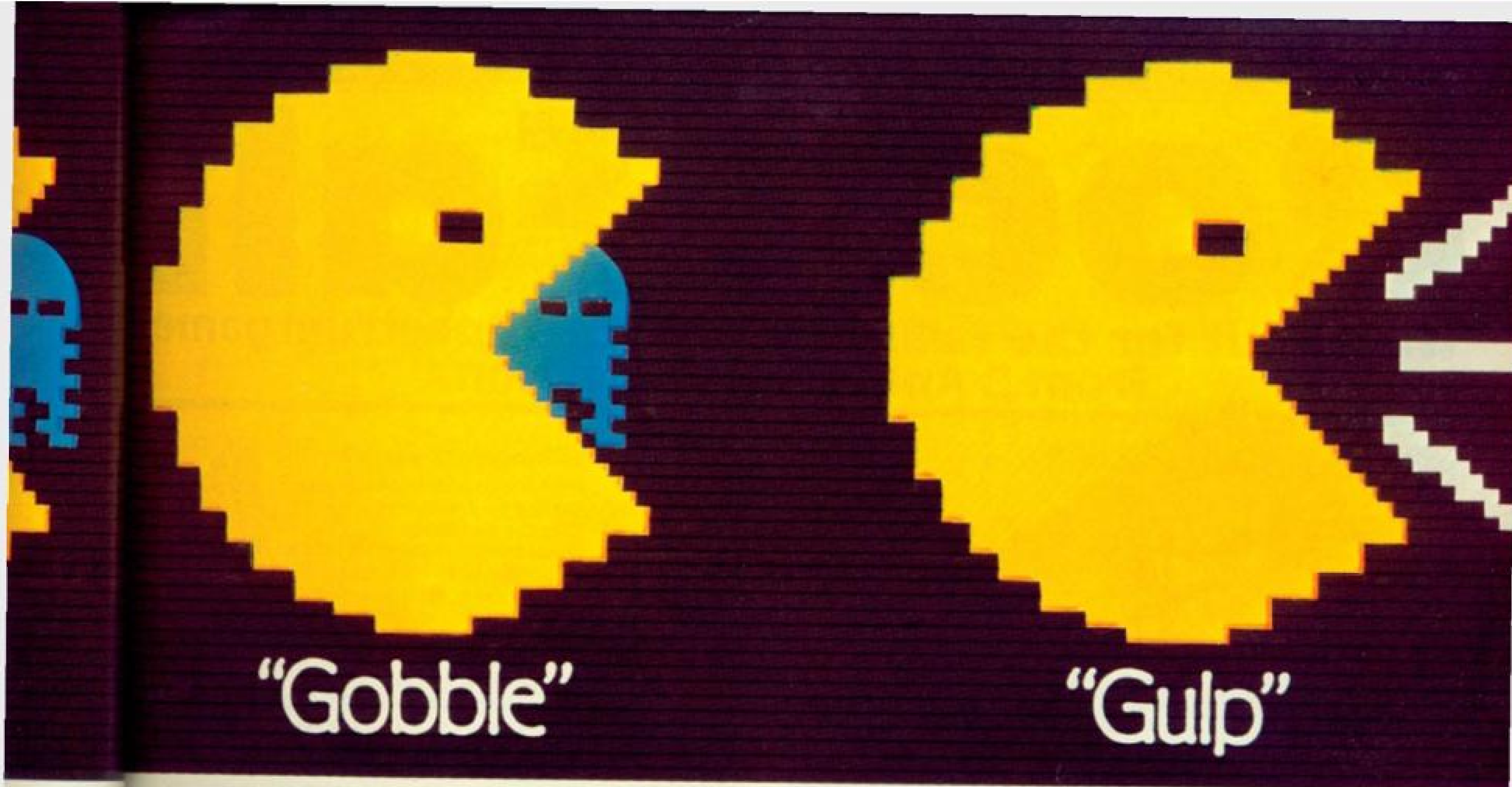
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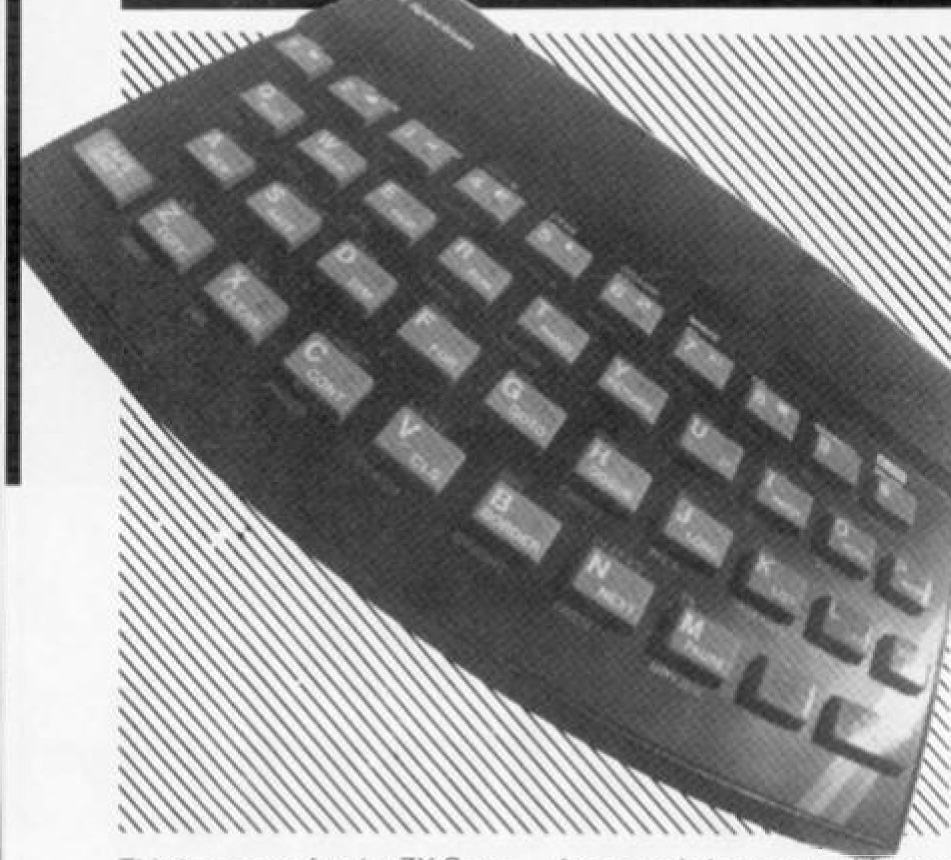
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Rock fall

Watch out for the falling rocks in this Spectrum game from B Andrews of Charlton.



This is a game for the ZX Spectrum which follows the general 'chase' theme. Although written in BASIC, and so not up to arcade game speed, the game is fun to play and should provide a springboard for you to improve upon it.

The idea of the game is that you manoeuver your character around the rocks trying to gather the six tokens which are scattered around the playing area. It's not quite as easy as it sounds as you are being chased by a number of ghouls intent on stopping you fulfilling your quest. There are nine levels of play, level nine being the easiest and perhaps the level you should start at when you first get to grips with the game. As you might have guessed, as you go up in level so the ghouls become faster and chase you with more fervour.

Once you have collected all six tokens, you move automatically to the next level and the game begins again complete with another six tokens for you to collect. Extra points can be gained by manoeuvring your character so that a rock falls on a following ghoul – not too easy, but with a bit of practice it can be done!

The game includes a high score readout once you have either cleared all nine levels or failed in your task.

Too many variables?

Here is a general guide to the variables used throughout the program:

Z, Q, G and S	General variables.
X and Y	The position of your character.
X(G) and Y(G)	The position of the ghouls.
SCORE	The score.
HS	The highest score so far.
C	The number of tokens collected by your character.
SK	The skill level you have chosen.
GHOUL	The level of the ghouls arranged to chase you.
S$ and Z$	General reply variables.

Line by line

Here follows a brief breakdown of the program:

Lines 10-70	Hold the user-defined graphics.
Lines 90-290	Set the screen display.
Line 300	Sets the variables.
Line 310	Prints the scores and sets the level.
Lines 320-360	Await the keyboard inputs.
Lines 370-400	Update the score and print the man.
Lines 410-440	Ask you if you would like to play another game or not.
Lines 450-480	Ask you for your skill factor, ie which level you would like to start on.
Lines 490-590	Move the ghouls and test whether or not the ghouls have caught up with you.
Lines 610-760	Contain the subroutines which move your character.
Lines 770-880	Contain the subroutine which makes the rock fall should your character pass underneath.
Lines 900-910	Print the rock as it falls on your character's head.
Lines 930-1180	Give you the instructions for playing the game.
Lines 1190-1300	Contain the subroutine for a rock falling on a ghoul's head.
Lines 1310-1400	Contain the 'finish game' subroutine and the subroutine which works out your final ranking
Lines 1410-1500	Contain the 'live or die?' subroutine should a rock fall on your character's head.
Lines 1510-1820	Contain the 'death' subroutine.
Lines 1830-2030	Contain the subroutine which sorts the game out once you have finished a level.

```
  10 DATA 24,24,255,60,60,36,36
36,12,30,62,127,255,127,62,28,3
,90,153,90,60,24,20,66,24,60,90
126,255,255,219,219
  20 DATA 0,0,219,219,255,255,2
3,219,255,195,165,153,153,165,1
5,255
  30 LET hs=0
  40 FOR z=USR "A" TO USR "G"-1
  50 READ g
  60 POKE z,g
  70 NEXT z
  80 GO SUB 930
  90 LET score=0
 100 BORDER 4: PAPER 7: INK 4:
-5
 110 PRINT
 120 FOR z=2 TO 20
 130 PRINT AT z,1;"[redacted]"
 140 BEEP .01,z
 150 NEXT z
 160 LET d=20
 170 IF sk<=2 THEN LET d=16
 180 FOR z=1 TO d
 190 LET r=INT (RND*19)+1: LET
=INT (RND*29)+1
 200 LET r1=INT (RND*19): LET p
=INT (RND*29)+1
 210 IF r<=1 OR r>=21 OR p<=1 O
 p>=31 OR r1<=1 OR r1>=21 OR p1
=1 OR p1>=31 THEN NEXT z
 220 PRINT AT r,p; INK 2; PAPER
4;"B";AT r1,p1; INK 2; PAPER 4;
3"
```

```
230 BEEP .01,10
240 NEXT z
250 INK 0: DRAW 0,167: DRAW 255,0: DRAW 0,-167: DRAW -255,0
260 FOR z=1 TO 8
270 LET q=INT (RND*28)+1
280 PRINT AT INT (RND*20)+2,q; INK 6; PAPER 4;"F"
290 NEXT z
300 DIM x(4): DIM y(4): LET x(3)=7: LET y(3)=18: LET x(4)=19: LET y(4)=7: LET c=0: LET ghoul=0: LET x(1)=16: LET y(1)=20: LET x(2)=4: LET y(2)=28: LET x=3: LET y=2
310 PRINT AT 0,0;"Score=";score;AT 0,17;"High score=";hs;AT 0,13;"level";sk
320 IF INKEY$="8" THEN GO SUB 610
330 IF INKEY$="h" THEN PAUSE 0
340 IF INKEY$="5" THEN GO SUB 650
350 IF INKEY$="7" THEN GO SUB 690
360 IF INKEY$="6" THEN GO SUB 730
370 LET ghoul=ghoul+1
380 IF ATTR (x,y)=60 THEN LET score=score+1
390 PRINT AT 0,6;score
400 PRINT AT x,y; INK 0; PAPER 1;"A": BEEP .01,39
410 IF c>=6 THEN GO TO 1830
420 IF ATTR (x-1,y-1)=34 OR ATTR (x-1,y-1)=98 AND ATTR (x,y-1)=124 THEN GO SUB 770
430 IF ATTR (x-1,y+1)=34 OR ATTR (x-1,y+1)=98 AND ATTR (x,y+1)=124 THEN GO SUB 830
440 IF ATTR (x-2,y)=34 OR ATTR (x-2,y)=98 THEN GO SUB 890
450 LET s=sk
460 IF sk<=2 THEN LET s=2
470 IF s>ghoul THEN GO TO 320
480 LET ghoul=0
490 FOR g=1 TO 4
500 PRINT AT x(g),y(g); INK 4;"■"
510 IF x>x(g) AND ATTR (x(g)+1,y(g))=60 OR ATTR (x(g)+1,y(g))=32 THEN LET x(g)=x(g)+1: GO TO 530
520 IF x<x(g) AND ATTR (x(g)-1,y(g))=60 OR ATTR (x(g)-1,y(g))=32 THEN LET x(g)=x(g)-1
530 IF y>y(g) AND ATTR (x(g),y(g)+1)=60 OR ATTR (x(g),y(g)+1)=32 THEN LET y(g)=y(g)+1: GO TO 580
540 IF y<y(g) AND ATTR (x(g),y(g)-1)=60 OR ATTR (x(g),y(g)-1)=32 THEN LET y(g)=y(g)-1
550 IF x(g)=x AND y(g)=y THEN GO SUB 1510
560 IF x(g)>20 OR x(g)<0 THEN LET x(g)=ABS x(g)-1
570 IF y(g)>30 OR y(g)<1 THEN LET y(g)=ABS y(g)-1
580 PRINT AT x(g),y(g); PAPER 4; INK 1;"D"
590 NEXT g
600 GO TO 320
610 PRINT AT x,y; INK 4; BRIGHT 1;"■"
620 IF ATTR (x,y+1)=38 THEN LET y=y+1: LET c=c+1: LET score=score+20: BEEP .05,20: BEEP .05,10: BEEP .1,12: RETURN
630 IF ATTR (x,y+1)=100 OR ATTR (x,y+1)=60 OR ATTR (x,y+1)=124 THEN LET y=y+1: RETURN
640 RETURN
650 PRINT AT x,y; INK 4; BRIGHT 1;"■"
660 IF ATTR (x,y-1)=38 THEN LET y=y-1: LET c=c+1: LET score=score+20: BEEP .05,20: BEEP .05,10: BEEP .1,12: RETURN
670 IF ATTR (x,y-1)=100 OR ATTR (x,y-1)=60 OR ATTR (x,y-1)=124 THEN LET y=y-1: RETURN
680 RETURN
690 PRINT AT x,y; INK 4; BRIGHT 1;"■"
700 IF ATTR (x-1,y)=38 THEN LET x=x-1: LET c=c+1: LET score=score+20: BEEP .05,20: BEEP .05,10: BEEP .1,12: RETURN
710 IF ATTR (x-1,y)=100 OR ATTR (x-1,y)=60 OR ATTR (x-1,y)=124 THEN LET x=x-1: RETURN
720 RETURN
730 PRINT AT x,y; INK 4; BRIGHT 1;"■"
740 IF ATTR (x+1,y)=38 THEN LET x=x+1: LET c=c+1: LET score=score+20: BEEP .05,20: BEEP .05,10: BEEP .1,12: RETURN
750 IF ATTR (x+1,y)=100 OR ATTR (x+1,y)=124 OR ATTR (x+1,y)=60 THEN LET x=x+1: RETURN
760 RETURN
770 FOR z=x TO 21
780 IF ATTR (z,y-1)=124 THEN PRINT AT z,y-1; PAPER 4; INK 2;"B";AT z-1,y-1; INK 4; BRIGHT 1;"■": BEEP .01,z: GO TO 800
790 RETURN
800 IF ATTR (z+1,y-1)=33 OR ATTR (z+1,y-1)=37 THEN GO SUB 1190
810 NEXT z
820 RETURN
830 FOR z=x TO 21
840 IF ATTR (z,y+1)=124 THEN PRINT AT z,y+1; PAPER 4; INK 2;"B";AT z-1,y+1; INK 4; BRIGHT 1;"■": BEEP .01,z: GO TO 860
850 RETURN
860 IF ATTR (z+1,y+1)=33 OR ATTR (z+1,y+1)=37 THEN GO SUB 1250
870 NEXT z
880 RETURN
890 REM
900 IF ATTR (x-1,y)<>60 AND RND*10>7 THEN PRINT AT x-1,y;"B";AT x-2,y; INK 4;"■";AT x,y; INK 2; BRIGHT 1;"C": GO SUB 1410
910 RETURN
920 STOP
930 PAPER 7: BORDER 7: CLS : PRINT AT 0,10;"ROCK-FALL"
940 PRINT AT 4,10;"COPYRIGHT"
950 PRINT '';" © BRIAN ANDREWS JUNE 1982"
960 LET new=1: GO TO 1950
970 BORDER 7: PAPER 7: INK 0: CLS
980 PRINT AT 0,10; INK 2;"ROCK-FALL"
990 PRINT " The object of the game is to "
1000 PRINT " pick up 6 of the F symbols "
1010 PRINT " at each level without being "
1020 PRINT " caught by the D ghouls"
1030 PRINT '" You are the A symbol"
1040 PRINT '" Use the cursor keys to move"
1050 PRINT " your man around the scenario"
1060 PRINT '" You score extra points if you"
1070 PRINT " make a rock B land
```

```
on a ghoul"
1080 PRINT '"You can trap the gh
ouls because"
1090 PRINT " they cant cross you
r path or"
1100 PRINT " manouvre around the
 boulders"
1110 PRINT '"BEWARE of falling
boulders!!!!!!"
1120 PRINT '"Enter your skill le
vel(1 TO 9)"
1130 LET s$=INKEY$
1140 IF s$="" THEN GO TO 1130
1150 IF CODE s$>57 OR CODE s$<49
 THEN GO TO 1130
1160 LET sk=CODE s$-48
1170 LET new=0
1180 RETURN
1190 PRINT AT z+1,y-1; INK 7; PA
PER 4;"E"
1200 FOR z=8 TO 10: FOR q=25 TO
1 STEP -(RND*4)-1
1210 BEEP .1,z: BEEP .1,q
1220 NEXT q: NEXT z
1230 LET score=score+100
1240 RETURN
1250 PRINT AT z+1,y+1; INK 7; PA
PER 4;"E"
1260 FOR z=8 TO 10: FOR q=25 TO
1 STEP -RND*7+1
1270 BEEP .1,z: BEEP .1,q
1280 NEXT q: NEXT z
1290 LET score=score+100
1300 RETURN
1310 PAUSE 80
1320 PRINT "WELL DONE!! You have
 completed"
1330 PRINT " level 0 and have sc
ored ";score
1340 IF score>hs THEN LET hs=sco
re: PRINT "which is the highest
score today"
1350 IF score<1500 THEN LET d$="
Amateur"
1360 IF score>1500 AND score<250
0 THEN LET d$="Semi-skilled"
1370 IF score>2500 THEN LET d$="
Skilled"
1380 IF score>3000 THEN LET d$="
Proffesional"
1390 PRINT '"   Your ranking is
";d$
1400 GO TO 1770
1410 LET die=0: LET live=0
1420 FOR z=1 TO 25 STEP INT (RND
*5)+1
1430 BEEP .1,z
1440 LET rand=RND*10
1450 IF rand>=6 THEN LET die=die
+1: NEXT z
1460 LET live=live+1
1470 NEXT z
1480 IF die>live THEN GO TO 1510
1490 PRINT AT x,y+1;"A";AT x,y;
PAPER 4; INK 2;"B";AT x-1,y; BRI
GHT 1; INK 4;"■"
1500 LET y=y+1: RETURN
1510 BORDER 7: CLS : PRINT AT 0,
12; FLASH 1; INK 2;"YOU ARE"
1520 FOR z=5 TO 10: BEEP .01,z:
PRINT AT z,3; INK 2;"■": NEXT z
1530 PRINT AT 5,5; INK 2;"■"
1540 PRINT AT 6,6; INK 2;"■"
1550 LET dt=4
1560 PRINT AT 9,6; INK 2;"■"
1570 PRINT AT 10,5; INK 2;"■"
1580 FOR z=4 TO 6: LET dt=dt+1:
PRINT AT dt,z; INK 2;"■": BEEP .
01,dt: NEXT z
1590 FOR z=6 TO 4 STEP -1: BEEP
.01,z: LET dt=dt+1: PRINT AT dt,
z; INK 2;"■": NEXT z
1600 FOR z=5 TO 10: BEEP .01,z:
PRINT AT z,8; INK 2;"■": NEXT z
1610 FOR z=8 TO 11: PRINT AT 5,
z; INK 2;"■";AT 7,z;"■";AT 8,z;"
";AT 10,z;"■": BEEP .01,z: NEXT
z
1620 FOR z=5 TO 10: BEEP .01,z:
PRINT AT z,13; INK 2;"■  ■"
1630 NEXT z
1640 FOR z=14 TO 16: BEEP .01,z
PRINT AT 5,z; INK 2;"■";AT 7,z
"■";AT 8,z;"■": NEXT z
1650 FOR z=5 TO 10: BEEP .01,z:
PRINT AT z,19; INK 2;"■": NEXT
1660 LET dt=4
1670 FOR z=20 TO 22: BEEP .01,z
LET dt=dt+1: PRINT AT dt,z; IN
2;"■": NEXT z
1680 FOR z=22 TO 20 STEP -1: BE
P .01,z: LET dt=dt+1: PRINT AT
t,z; INK 2;"■": NEXT z
1690 PRINT AT 5,21; INK 2;"■";A
5,22;"■";AT 9,22;"■";AT 10,21;
"■"
1700 FOR z=5 TO 8: PRINT AT z,2
: INK 2;"■": NEXT z
1710 PRINT AT 10,27;"■"
1720 FOR z=20 TO 30 STEP RND*RN
*10+1: BEEP .01,z: BEEP .01,RND
RND*15: NEXT z
1730 PRINT AT 15,5;"Your score
s ";score: IF score>hs THEN PR
NT "  which is the highest toda
"
1740 IF score>hs THEN LET hs=sc
re
1750 GO TO 1350
1760 PRINT '"      You reached
evel ";sk
1770 PRINT '"Another try (y/n)?
1780 LET z$=INKEY$
1790 IF z$="" THEN GO TO 1780
1800 IF z$="y" THEN CLS : RESTO
= 5: GO TO 40
1810 IF CODE z$<>110 THEN GO TO
1780
1820 CLS : STOP
1830 REM
1840 CLS : PRINT FLASH 1;AT 0,8
"CONGRATULATIONS"
1850 FOR z=INT (RND*5) TO 25 ST
P (RND*7)+1
1860 BEEP .1,z
1870 NEXT z
1880 PRINT '"    You have cleare
 6 crosses"
1890 PRINT "'      from level
;sk
1900 PRINT '''
1910 LET sk=sk-1
1920 IF sk<0 THEN GO TO 1310
1930 PRINT "  You will return a
level ";sk
1940 PRINT AT 21,2;" Press any
ey to continue"
1950 FOR b=3 TO 25
1960 LET mo1=b: LET mo2=mo1-1:
ET mo3=mo2-1: LET mo4=b-1
1970 PRINT AT 12,mo1; INK INT (
ND*7);"■■■";AT 12,mo1-1;" ";AT
13,mo2;"■■■■■";AT 13,mo2-1;" "
AT 14,mo3;"■■■■■■■";AT 14,mo3-1
" ";AT 15,mo3;"■■■■■■■";AT 15,m
3-1;" ";AT 16,mo3;"■■■■■■■";AT
6,mo3-1;" ";AT 17,mo3;"■■■■■■■
AT 17,mo3-1;" ";AT 18,mo3;"■■
■■■";AT 18,mo3-1;" ";AT 19,mo3;"
■■■■■■■";AT 19,mo3-1;" "
1980 PRINT AT 14,mo1+1; OVER 1;
INK 6;"■";AT 14,mo1+3;"■"
1990 BEEP .01,b: BEEP .01,mo3
2000 NEXT b
2010 IF new THEN GO TO 970
2020 PAUSE 0
2030 GO TO 100
2040 STOP
```

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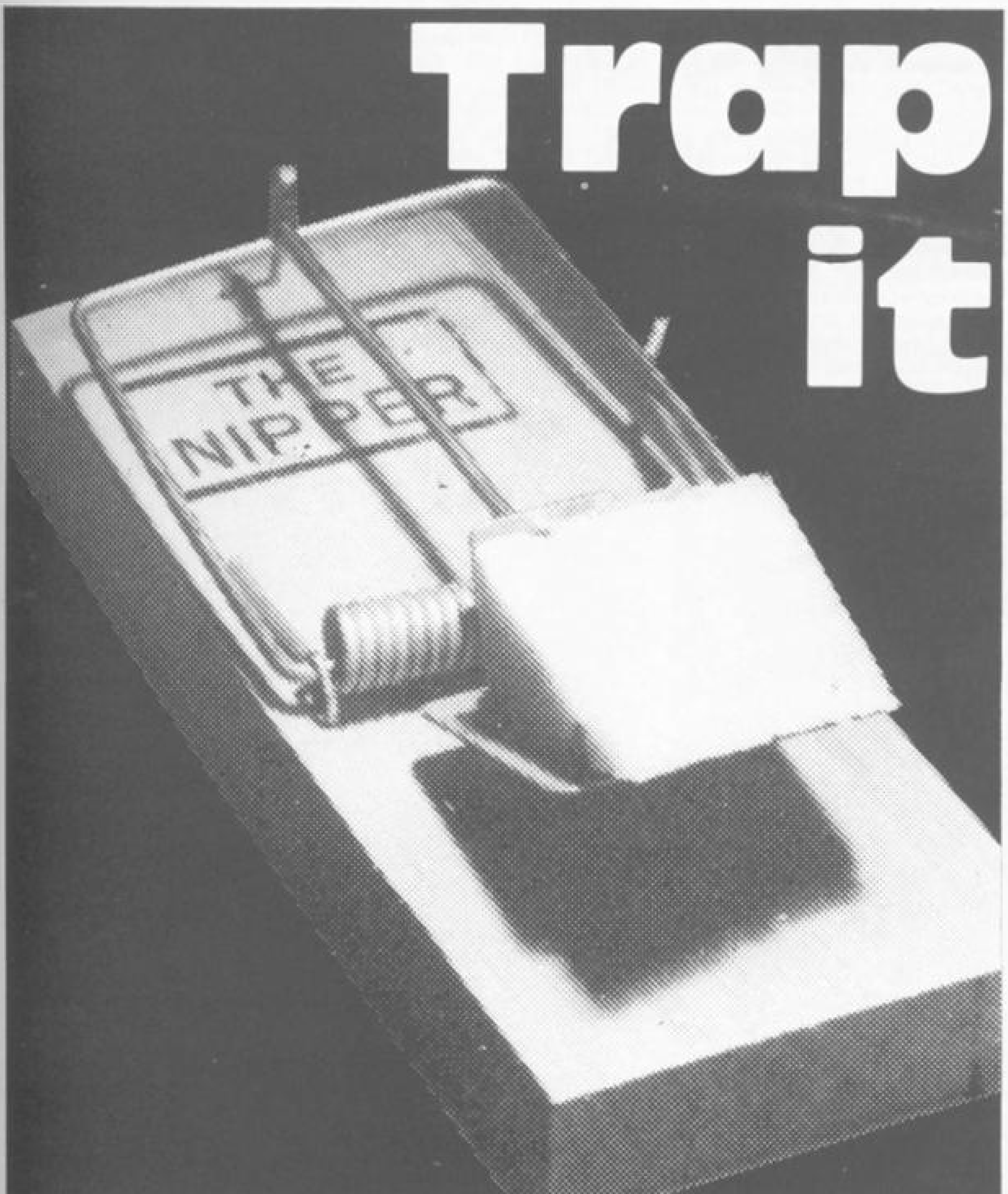
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ZX 2/84

Trap it



The experts said it couldn't be done – to disable the Break key in a BASIC program, but Mr D Pope shows us how it CAN be done.

ON–ERROR processing is one of the few useful features omitted on the Sinclair machines but I realised quite recently that it would be possible (with the aid of a small machine code routine) to provide such a function. In the section of the Spectrum manual which contains details of the system variables (Chapter 25) there is a WORD entry called ERR SP at address 23613 which is described as the "Address of item on machine stack to be used as error return", which I examined by using the PEEK command in a function as shown below.

It was obvious that the word at 23613 pointed at an entry in the machine stack and this was printed giving the value 4867 which is within the Sinclair ROM. I wrote a small machine code routine (not included here) which simply jumped to 4867 after placing a required value into the system variable ERR NR and found that I got the appropriate error report as shown in the Sinclair manual in appendix B. It seemed reasonable to assume that, if the stack entry pointed to by ERR SP was altered to address a machine code routine other than 4867, then any subsequent error would cause the alternative routine to execute.

I developed the machine code routine shown quite quickly and it worked for all errors except 12 (C in the Sinclair manual) "Nonsense in BASIC" which, despite considerable further effort, I could not trap without putting the machine into a recursive loop. The machine code routine consists of two parts, the first labelled START is run from BASIC with an appropriate USR nnnn call and this places the address of the second part, TRAP, into the machine stack entry pointed to by ERR SP. The TRAP routine is then entered on any "error" completion (from 0 upwards).

Names and addresses

Although comprehensive comments have been included with the machine code, a little additional explanation is probably worthwhile, particularly since the routines were written to be run wherever they are placed in memory. First, the address of TRAP placed onto the machine stack must be the correct 'absolute address' regardless of where the routine is stored. This is calculated dynamically by the first two instructions, relying on the fact that the BC register pair contains the address of START on entry from the USR nnnn function. This absolute address is placed into the machine stack entry pointed to by ERR SP by the next five instructions. Secondly, the TRAP routine must be able to replace its own entry address onto the machine stack if it is to handle successive errors and although this is done by the two instructions starting at PUSH, the value used for TRAP in the LD DE,TRAP instruction must be modified in order to allow it to function correctly when loaded at differing memory addresses. The last five instructions in the START routine before RET place the corrected value into the instruction labelled PUSH to overcome this problem.

It must be stressed that instruction modification of this type is very bad programming practice and should only be used where there is no alternative. The modified instructions should be adequately explained as should those which carry out the modification. In this instance I could see no way of avoiding dynamic instruction modification but if anyone can offer an alternative approach I should be most interested to hear from them.

Basically speaking

When the trap routine is entered (on any BASIC completion) it first checks the given error code and passes control to the normal error handling code at 4867 if

the error is either 0 (OK), 9 (STOP), or 12 (Nonsense in BASIC); this gives the BASIC programmer the option to allow his program to end normally when required by executing STOP or issuing a GOTO for a line past the end of the program. Without this way out the only way to terminate a program with TRAP incorporated would be to pull out the power lead, a point which will not be missed by anyone who wishes to "protect" the code of a BASIC program. As indicated at the beginning of the article error 12 seems impossible to recover from and is therefore also given back to the Spectrum routine to handle.

For any error other than 0, 9 and 12 the TRAP stack entry is restored and then the number of the BASIC line chosen to begin ON–ERROR processing is placed into the system variable NWPPC. I chose line 9900, statement 1 but this could easily be changed as required by following the comments against the EQUates for GTOLL, GTOLH and GTOST. In order that the users' error handling routine (beginning at line 9900) can make routing decisions based on the line where the error occurred, the next few instructions save the line, statement and error numbers. These details could be placed into any spare memory locations (four bytes are required) but, since I do not have a printer, I often use the printer buffer as workspace and the routine stores the crash details there. The error line number is placed into the word at 23296, the statement number within that line is put into the byte at 23298 and the actual error number (increased by 1) is stored in the byte at 23299. It should be noted that the error is stored as a binary number, not in the equivalent character form given in the normal error reports expected from the BASIC; thus 21 would be shown following an attempted "BREAK" if the contents of 23299 was PEEKED.

Finally in the TRAP routine, the ERR NR is reset to 255 (its normal value) and a jump is made to the normal processing loop used when executing a BASIC program. The address (7030) of MAINL was found by a small routine (not included here) which printed the contents of the first few machine stack entries, which always shows 7030 immediately below the word with 4867. Although the routine could be used from a direct command it would serve little purpose since the trap address would be reset by the Spectrum routine when the command execution completed. The TRAP only needs to be set up once in a BASIC program and will continue to pass errors to line 9900 until an error 0, 9 or 12 is encountered.

Any BASIC programmer who has ever wished for an ON–ERROR function will have few problems finding uses for this routine but, as a starter, it is fun to produce a small program which keeps going regardless of attempts to "BREAK" it and only finishes when it has done its job:

```
10 RANDOMISE USR nnnn
20 PRINT "STOP ME IF
   YOU CAN."
30 FOR a = 1 TO 10000
40 PRINT AT 1,0;a
50 NEXT a
60 STOP
9900 PRINT AT 4,0;"NO, I
     WON'T."
9910 PAUSE 100
9920 CLS
9930 GOTO 40
```

Of course the value used for "nnnn" will depend on where you decide to place the TRAP routine. I have not included a loader with the routine details because so many good examples have been printed in the past that most people must be able to enter a machine code program without problems.

The function for displaying WORD length data from any memory location which w[...] mentioned at the beginning [...] the article is:

```
10 DEF FN a(x) = PEEK
   x + 256 * PEEK (x + 1)
```

whereupon PRINT FN a(2361[...] gives a value just below RA[...] TOP, and entering PRINT F[...] a(FN a(23613)) should retu[...] 4867.

Incidentally, I believe [...] similar function could be p[...] duced to give ON–ERR[...] handling to ZX81 users sin[...] that machine has a similar co[...] figuration of system variable[...] Unfortunately I sold my ZX81 [...] fund the Spectrum and cann[...] therefore give any assistan[...] with that project!

```
211400     START  LD    HL, OFFSET       ; get offset to trap from entry point
09                ADD   HL,BC            ; add entry address from BC reg pair
ED5B3D5C          LD    DE,(ERRSP)       ; get addr of stacked error return
EB                EX    DE,HL            ;HL now points at stacked error rtn
73                LD    (HL),E           ; changed stacked value to point at TRAP
23                INC   HL               ; one byte at a time . . .
72                LD    (HL),D           ; any error will now execute TRAP
212700            LD    HL,TRAPA         ; get offset to our trap restore instruction
09                ADD   HL,BC            ; add entry address as above
73                LD    (HL),E           ; and store this into the PUSH below
23                INC   HL               ; one byte at a time . . .
72                LD    (HL),D           ; to ensure code can be loaded anywhere
C9                RET                    ; go back to BASIC, setup is finished
           ;      TRAP ROUTINE ENTERED ON ANY ERROR
210313     TRAP   LD    HL,BTRAP         ; prepare to use SPECTRUM error rtn
3A3A5C            LD    A,(ERRNR)        ; get the error code
3C                INC   A                ; add one to get correct value
2808              JR    Z,JUMP           ; if the BASIC opted to finish, do so
FE09              CP    9                ; error 9 is STOP, if the BASIC opted
2804              JR    Z,JUMP           ; for this then do so
FE0C              CP    12               ; error 12 (C) is NONSENSE IN BASIC, if
2001              JR    NZ,PUSH          ; we trap that we are recalled for ever
E9         JUMP   JP    (HL)             ; finish via BASIC error routine on 0,9,12
11EE5C     PUSH   LD    DE,TRAP          ; this instruction is 'modified' at set up
D5                PUSH  DE               ; restore our TRAP entry point for futures
21425C            LD    HL,NWPPC         ; force a 'GOTO 9900' when we return to BASI[...]
36AC              LD    (HL), GTOLL      ; low byte of line number 9900
23                INC   HL               ; step to NEWPPC + 1
3626              LD    (HL), GTOHL      ; high byte of line number 9900
23                INC   HL               ; step to NSPPC
3601              LD    (HL),GTOST       ; statement 1 of line 9900
23                INC   HL               ; step HL to PPC, the line we trapped from
11005B            LD    DE,PRTBF         ; point DEstination at the vacant buffer
010300            LD    BC,3             ; set a byte count of 3, and save trapped
EDBO              LDIR                   ; line and statement in print buffer
3A3A5C            LD    A,(ERRNR)        ; pick up the error code
3C                INC   A                ; step it to give corrected value
12                LD    (DE),A           ; and save the trap code in the p. buffer
3EFF              LD    A,255            ; reset trap code to 0 (minus 1)
323A5C            LD    (ERRNR),A        ; and replace in error code variable
C3761B            JP    MAINL            ; return to BASIC interpreter
           ;      EQUATES
0014       OFFSET EQU   TRAP-START       ; used to create the actual TRAP address
0027       TRAPA  EQU   PUSH + - START   ; gives offset to TRAP addr in instr. PUSH
1303       BTRAP  EQU   4867             ; the normal trap used by BASIC
5C42       NWPPC  EQU   23618            ; the system variable for GOTO line
5C3A       ERRNR  EQU   23610            ; system variable containing report code - 1
5B00       PRTBF  EQU   23296            ; start of printer buffer, free if no pr.
0026       GTOHL  EQU   38               ; HI byte of line no 9900.INT(9900/256)
00AC       GTOLL  EQU   172              ; LO byte of line no 9900.9900-256*38
0001       GTOST  EQU   1                ; statement no within line 9900
1B76       MAINL  EQU   7030             ; BASIC interpreter to continue running
5C3D       ERRSP  EQU   23613            ; pointer to stacked error return address
                  END                    ; program length is 004Bh - 75 decimal
```

which was
beginning of

PEEK
(x + 1)

FN a(23613)
below RAM-
g PRINT FN
hould return

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King-kong

A great adaptation of the arcade game from Nicholas Wyre of Monks Risborough.



In this game, you must attempt to save a girl from the evil clutches of the giant gorilla, King-kong. To get to the girl and free her, you must jump over the gorillas and holes, and climb the ladders.

However, you must carry out three tasks in order. These are:
1 — Go and rescue the girl from the clutches of King-kong. To do this you will have to either jump between King-kong's legs where there is a space, or jump onto the barrel and run to keep up with it and jump off again. If you fall off the barrel, the line will break and you will fall to your death.
2 — When you have managed to free the girl, you must go back down to the ground level and press the button at the bottom left of the screen.
3 — Lastly, you must knock out the pins on each level by running over them. When you have knocked out the last pin, King-kong will fall to his death. If during the game, you accidently knock a girder out you will not be able to complete this part of the game — so take care.

The key to success

The keys used to manipulate your character around the screen are as follows:

4 — Jump to the left.
5 — Run to the left.
6 — Go down a ladder.
7 — Go up a ladder.
8 — Run to the right.
9 — Jump to the right.

Program description

The program comprises two parts, the first of which is the main part of the program. Here follows a brief breakdown of the operation of the listing:

Lines 10-30	Load the user-defined graphics from Listing 2 and set the variables.
Lines 40-50	Set up the clock.
Lines 60-140	The main part of the program.
Lines 100-130	Print King-kong.
Lines 140-270	Move the gorillas and the barrel.
Lines 190-320, 370 and 380	Move your character.
Lines 330-360	See if your character has hit anything.
Lines 280 and 390	See if your character has reached the girl character or pressed the button.
Lines 420-440	Tell you that your character has been killed.
Lines 450-470	Ask you if you would like to play another game.
Lines 480-520	Your character falls through a hole.
Lines 530-550	Your character is dead.
Lines 560-610	Your character breaks the line by falling off the barrel.
Lines 620-650	Your character walks over a pin.
Lines 660-770	The girl character goes to the lift.
Lines 780-800	Your character jumps to the left.
Lines 810-830	Your character moves to the right.
Lines 840-870	The girder falls.
Lines 880-900	The lift goes up with the girl inside.
Lines 910-920	The final girder pin falls along with King-kong.
Lines 930-970	You are asked if you want another game.
Lines 980-990	You are told you have completed your mission in the shortest time.
Lines 1000-1160	Print the building site.

Typing tips

First of all, you should type in the program. Listing 1. You should then SAVE it to tape and VERIFY it. Now NEW the computer to wipe the listing out of memory. Now type in Listing 1 and RUN the program. When the program has finished RUNning, it will instruct you to start SAVEing. The user-defined characters will then be SAVEd after the main program, so that when you LOAD the program on tape the user-defined graphics will automatically be LOADed into the main program via line 20.

The number of times the gorillas follow you is governed by the '.75' in line 160. If you alter the .75 to 1, the gorillas will not follow you and consequently, if you make this figure less than .75 the gorillas will follow you more often.

```
  10 REM        "KING-KONG"
     by     NICHOLAS WYRE
  20 LOAD "CHARACTERS"CODE USR "
A",18*8: BORDER 2: INK 3: PAPER
5: CLS : LET H=9999: LET N$="NIC
HOLAS WYRE"
  30 LET X=0: LET E=1: LET F=-1:
 LET C=1: LET V=21: LET G=500: L
ET M=21: LET N=2: LET E=1: LET T
=0: LET E$="G": GO SUB 1000: LET
 B=2: LET D=1
  40 POKE 23672,0: POKE 23673,0:
 POKE 23674,0
  50 DEF FN S()=INT ((PEEK 23672
+PEEK 23673*256+PEEK 23674*65535
)/50)
  60 PRINT AT M,N; INK 1; OVER 1
;E$: BEEP .05,10: PRINT AT M,N;
OVER 1; INK 1;E$
  70 PRINT AT 2,B; INK 1;" R ";A
T 1,B;"_:_"
  80 PRINT AT 9,C;" L  L  L ";AT
 13,V;" L  L  L ";AT 17,C;" L  L
 L ";AT 21,V;" L  L  L "
  90 LET Z$=INKEY$
 100 IF RND<.5 THEN PRINT AT 3,1
9;"██ ": GO TO 120
 110 PRINT AT 3,19;"A█C"
 120 IF RND<.5 THEN PRINT AT 5,1
9;"D E": GO TO 140
 130 PRINT AT 5,19;"ED "
 140 IF B=2 THEN LET D=1
 150 IF B=6 THEN LET D=-1
 160 IF RND<.75 THEN GO TO 220
 170 IF V>2 AND V>N THEN LET V=V
-1
 180 IF V<21 AND V<N THEN LET V=
V+1
 190 IF C<21 AND C<N THEN LET C=
C+1
 200 IF C>2 AND C>N THEN LET C=C
-1
 210 GO TO 270
 220 LET C=C+E: LET V=V+F
 230 IF C>21 THEN LET E=-1
 240 IF C<3 THEN LET E=1
 250 IF V<3 THEN LET F=1
 260 IF V>21 THEN LET F=-1
 270 LET B=B+D
 280 IF M=2 AND N=11 AND X=0 THE
N GO SUB 660
 290 IF Z$="7" AND ATTR (M-1,N)=
41 THEN LET E$="N": LET M=M-1
 300 IF Z$="6" AND ATTR (M+1,N)=
41 THEN LET E$="N": LET M=M+1
 310 IF Z$="5" AND N>0 THEN LET
N=N-1: LET E$="K"
 320 IF Z$="8" AND N<>31 THEN LE
T E$="H": LET N=N+1
 330 IF SCREEN$ (M,N)<>" " AND A
TTR (M,N)=40 THEN GO TO 420
 340 IF SCREEN$ (M,N)="_" THEN G
O TO 560
 350 IF SCREEN$ (M+1,N)=" " AND
M<>21 THEN GO TO 480
 360 IF ATTR (M+1,N)=107 THEN GO
 SUB 620
 370 IF Z$="4" AND N>1 THEN GO S
UB 780
 380 IF Z$="9" AND N<30 THEN GO
SUB 810
 390 IF M=21 AND N=0 AND X=1 THE
N GO SUB 880
 400 BEEP .01,1
 410 GO TO 60
 420 PRINT AT M,N; FLASH 1;"O";A
T 10,13;"CRUNCH"
 430 FOR N=0 TO 7: FOR X=0 TO 7:
 BEEP .05,N: BORDER RND*7: NEXT
X: NEXT N
 440 PAPER 3: INK 7: CLS : FLASH
 1: PRINT AT 8,5;(" KING-KONG KI
LLED YOU " AND M=5);AT 8,5;("A G
ORILLA SQUASHED YOU" AND M<>5)
 450 PRINT AT 18,1;"PRESS ANY KE
Y TO PLAY AGAIN  !";AT 14,1;"SHO
RTEST TIME = ";H''"by ";N$
 460 IF INKEY$="" THEN BEEP .01,
RND*25: BORDER RND*7: GO TO 460
 470 FLASH 0: BORDER 2: INK 3: P
APER 5: CLS : GO TO 30
 480 IF SCREEN$ (M,N)<>" " THEN
LET M=M-1: GO TO 530
 490 PRINT AT M,N;"G";AT M-1,N;"
"
 500 IF M=21 THEN GO TO 530
 510 LET M=M+1: BEEP .03,M
 520 GO TO 480
 530 PRINT AT M,N; FLASH 1;"O";A
T 10,13;"SPLAT!"
 540 FOR N=0 TO 7: FOR S=7 TO 0
STEP -1: BEEP .01,S*N: BORDER S:
 NEXT S: NEXT N
 550 PAPER 4: INK 1: CLS : FLASH
 1: PRINT AT 8,4;"YOU FELL THROU
GH  A HOLE";AT 10,9;"TO YOUR  DE
ATH";AT 12,1;"AND YOU ARE NOW MU
CH THINNER !": GO TO 450
 560 PRINT AT 1,2;"-          -";AT 2
,2;"|          |";AT 3,2;"|          |";AT
```

```
 4,2;"R": LET N=N+(1 AND N=2)-(1
 AND N=7)
 570 FOR A=2 TO 5: PRINT AT A-1,
N;" "
 580 BEEP .04,M
 590 PRINT AT A,N;"G": NEXT A
 600 LET M=5
 610 GO TO 530
 620 LET T=T+1: PRINT AT M+1,N;"
-"
 630 IF SCREEN$ (M+1,27)="-" AND
 N=13 THEN GO SUB 840
 640 IF SCREEN$ (M+1,13)="-" AND
 N=27 THEN GO SUB 840
 650 BEEP .01,50: RETURN
 660 LET X=1
 670 PRINT AT 0,8; FLASH 1;"MMMM
MM": BEEP 1,10
 680 FOR A=11 TO 13: PRINT AT 1,
A;" P";AT 2,A;" Q": BEEP .05,A:
NEXT A
 690 INK 1
 700 PRINT AT 2,14;"F": BEEP .05
,50
 710 FOR A=14 TO 25: PRINT AT 0,
A;" P";AT 1,A;"■Q": BEEP .01,A:
NEXT A
 720 PRINT AT 0,13;" F";AT 1,14;
"F"
 730 FOR A=0 TO 3: PRINT AT A,26
;"F";AT A+1,26;"P";AT A+2,26;"Q"
: BEEP .05,A: NEXT A
 740 PRINT AT 4,26;"FP";AT 5,26;
"FQ": BEEP .0,50
 750 FOR A=27 TO 29: PRINT AT 4,
A;" P";AT 5,A;" Q": BEEP .05,A:
NEXT A
 760 INK 1: PRINT AT 4,29;"▌";AT
 5,29;"▌";AT 4,30; FLASH 1;"P";A
T 5,30;"Q"
 770 FLASH 0: RETURN
 780 PRINT AT M-1,N-1; OVER 1;"J
": BEEP .05,M: PRINT AT M-1,N-1;
 OVER 1;"J": BEEP .05,M
 790 IF SCREEN$ (M,N-2)<>" " AND
 ATTR (M,N-2)=40 THEN GO TO 420
 800 LET N=N-2: RETURN
 810 PRINT AT M-1,N+1; OVER 1;"I
": BEEP .05,M: PRINT AT M-1,N+1;
 OVER 1;"I": BEEP .05,M
 820 IF SCREEN$ (M,N+2)<>" " AND
 ATTR (M,N+2)=40 THEN GO TO 420
 830 LET N=N+2: RETURN
 840 IF T=8 AND X=2 THEN GO TO 9
10
 850 FOR Q=M+1 TO M+4
 860 BEEP .01,Q: PRINT AT Q-1,14
;"              ";AT Q,14;"■■■■■■
■■■■■■■": NEXT Q
 870 RETURN
 880 LET X=2: PRINT AT 4,30;"■";
AT 5,30;"■";AT 3,30;"■"
 890 BEEP 1,0
 900 FOR A=5 TO 2 STEP -1: PRINT
 AT A,29;"   ";AT A-3,29;" ■■ ":
BEEP .1,A: NEXT A: PRINT AT 2,29
;"   ": BEEP .1,10: PRINT AT 1,2
9;"   ": BEEP .1,15: PRINT AT 0,
29;"   ": BEEP 1,20: RETURN
 910 LET S=FN S(): PRINT AT 2,20
;" ";AT 3,19;"A■CGULP!": BEEP .5
,2: PRINT AT 3,19;"         ";AT
4,19;"■■■";AT 5,20;"D": BEEP .5,
3: PRINT AT 4,19;"   ";AT 5,20;"
";AT 5,19;"B■■E": BEEP .5,3
 920 FOR Q=6 TO 21: PRINT AT Q,1
4;"■■■■■■■■■■■■■■";;AT Q-2,19;"
";AT Q-1,14;"        B■■E    ": B
EEP .05,Q: NEXT Q: FOR J=-50 TO
50: BEEP .03,J: NEXT J
 930 PAUSE 100: CLS : PRINT AT 2
,0;"YOU HAVE KILLED KONG AND YOU
    HAVE SAVED THE PRINCESS."'',
"TIME = ";S
 940 IF S<H THEN GO SUB 980
 950 PRINT AT 15,5;"THE SHORTEST
 TIME = ";H''"BY SIR ";N$
 960 PRINT AT 18,0; FLASH 1;"PRE
SS ANY KEY FOR ANOTHER  GAME!":
BORDER RND*7: BEEP .01,RND*25: I
F INKEY$="" THEN GO TO 960
 970: BEEP 1,8: CLS : GO TO 30
 980 LET H=S: INPUT "YOU HAVE TH
E SHORTEST TIME          PLEASE ENT
ER YOUR NAME ?           ";N$
 990 RETURN
1000 FOR Q=5 TO 21: PRINT AT Q,0
; INK 1;"F";AT Q,31;"F": NEXT Q
1010 PRINT AT 6,1; INK 0;"■■■■■
■■■■■■■■■■■■■■■■■■■■■■■■■■";AT 10
,0;"■ ■■ ■ ■■ ■ ■■■■■■■■■■■■■■
■ ■";AT 14,1;"■■■ ■■■■ ■ ■■■■■
■■■■■■■■■■ ■■";AT 18,0;"■■■■ ■■
■■■ ■■■■■■■■■■■■■■■■■■■■ ■"
1020 PRINT AT 11,0; OVER 1; INK
2;"{"'"{"
1030 FOR Q=7 TO 8: PRINT AT Q,3
; OVER 1; INK 2;"}";AT Q+8,31;"
": NEXT Q
1040 PRINT AT 19,0; PAPER 4;"@"
"@"'"@"
1050 INK 1: PRINT AT 1,2;"______
"
1060 PRINT AT 4,26;"F";AT 5,26;"
F";AT 4,1;"F";AT 5,1;"F"
1070 FOR Q=0 TO 3: PRINT AT Q,1
"F";AT Q,9;"F";AT Q,14;"F";AT Q
26;"F": NEXT Q
1080 PRINT AT 0,8; FLASH 1;"<HEL
P>"
1090 PRINT AT 3,9; INK 0;"■■■■■
";AT 1,15; INK 1;"▀▀▀▀▀▀▀▀▀▀▀"
1100 PRINT AT 1,11;"P";AT 2,11;"
Q"
1110 INK 1
1120 PRINT AT 3,29;" ▛▜ ";AT 4,2
;"▌▐";AT 5,29;"▌▐"; INK 6;AT 0
,30;"|";AT 1,30;"|";AT 2,30;"|"
1130 INK 0: PRINT AT 2,20;"B";AT
 3,19;"A■C";AT 4,20;"■";AT 5,19
"D E"
1140 INK 3: BRIGHT 1: PRINT AT 
,13;"■";AT 6,27;"■";AT 10,13;"■
;AT 10,27;"■";AT 14,13;"■";AT 1
,27;"■";AT 18,13;"■";AT 18,27;"
1150 BRIGHT 0: INK 0
1160 RETURN
1170 SAVE "KING-KONG" LINE 10
```

Listing 1. The main body of the listing. This calls the data from Listing 2.

```
1180 FOR A=144 TO 161
1190 FOR U=0 TO 7
1200 READ I
1210 POKE USR (CHR$ A)+U,I
1220 NEXT U
1230 NEXT A
1240 DATA 0,0,16,8,7,31,7,24,12
,219,219,255,227,153,195,126,0,
48,252,252,28,60,20,16,31,127,1
7,112,60,30,6,60
1250 DATA 254,254,254,2,2,0,0,0
66,66,66,126,66,66,66,66,56,40,
6,254,186,186,40,108,24,29,10,6
,68,30,98,65
1260 DATA 48,58,20,24,24,4,56,0
12,72,40,24,24,32,28,0,24,184,8
,60,58,120,70,130,153,189,153,2
5,60,60,102,195
1270 DATA 0,34,119,127,62,28,8,
,28,28,40,0,28,28,32,0,0,0,0,0,
6,97,221,255,129,153,189,189,15
,255,24,24,24,60,60,126,126,255
255,219
1280 DATA 56,66,129,165,165,129
66,56
1290 SAVE "CHARACTERS"CODE USR
A",18*8
```

Listing 2. This listing should be typed in first, and is later called from Listing 1.


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Mastering Machine Code — the final part

Sadly we've reached the last part of Toni Baker's superb series that takes the mystery out of Machine Code. But don't despair, she will be back and has promised us something special for the next issue . . .

This is to be the last in the series of articles bearing this title. This doesn't mean that I'm not writing for the magazine anymore — just that the next time around I'll be starting on something different. However, SINCE this is the last MMC bit, I thought I'd go out with a bang. I'd like to list for you what is possibly the most sophisticated machine code program ever printed in any computing magazine:

This is a WORD PROCESSOR program: I call it "WordSheep" in order to stop things from getting too serious. Let me describe to you what is does first of all, starting with the limitations.

Firstly, you may only work with one screenful of text at a time. This means that if you want to type out a long letter you must treat it in seperate parts, although note that this won't actually matter because using the ZX printer there will be no "join" between the screenfuls. You can't do clever things like copying whole paragraphs all over the place or shuffling blocks of text around. Here's what you CAN do:

The LETTER keys produce the letters of the alphabet — either in upper or lower case as required. You should not type ENTER between lines because the program will sort all that out for itself, straightening the right hand margin up in the process. The SPACE key works as you'd expect although the actual number of spaces between words is determined by the program and not by you, so that if you type five spaces between two words this will be compressed to one (or more, as required for the right hand margin to be straight). The NUMBER keys also do exactly what you'd expect them to. There are fourteen CONTROL FUNCTIONS available to you, and these are as follows:

EDIT:	(caps shift 1):	Bring down one line for editing.
CAPS LOCK:	(caps shift 2):	Change from L mode to C mode and vice versa.
CLEAR LINE:	(caps shift 3):	Erase one line of text.
CLEAR SCREEN:	(caps shift 4):	Blank the whole screen.
CURSOR LEFT:	(caps shift 5):	Move cursor left.
CURSOR DOWN:	(caps shift 6):	Move cursor down.
CURSOR UP:	(caps shift 7):	Move cursor up.
CURSOR RIGHT:	(caps shift 8):	Move cursor right.
COPY:	(caps shift 9):	Copy the screen onto the ZX printer.
DELETE:	(caps shift 0):	Delete one character at the cursor position.
ENTER:	(enter):	End of paragraph.
REFORM:	(symbol shift Q):	Re-construct paragraph after alterations have been made.
EXIT:	(symbol shift W):	Return to BASIC.
YOURS:	(both shifts):	User Defined Control Function.

Symbol shift in this program works slightly different to what you're used to. The differences are as follows:

Symbol shift Q	and symbol shift W are as above.
Symbol shift E	produces the copyright symbol '©' (character 7F).
Symbol shift I	produces something called a SOLID SPACE. This looks like a space to me and you, but isn't treated like one by the computer. It is in fact the graphics character whose code is 80. It may be used when specific spacing is required.

All other keys with symbol shift will produce the ASCII character which is printed in red either on or below that key. This means that you do not need to enter 'E' mode in order to obtain curly brackets — you simply press symbol shift F and G. (Note that 'E' mode is not used at all in this program, and that no keywords or tokens may be obtained).

OK: here's the program. In order to minimise errors I shall for a change include the absolute addresses which I have used. You may change these course — for instan subtracting 8000 from all addresses will allow t program to run on a 16 Spectrum. The only restrict on changing my addresses that the second and third tabl at the start of the program mu use the same high-part-addre all the way through — in case 'EA'. Before you st typing in the listing note that program uses 'GRAPHIC which is defined thus:

```
00    GRAPHIC_A    DEFB 0 0 0 0 0 0 0 0 b
00                 DEFB 0 0 0 0 0 0 0 0 b
FF                 DEFB 1 1 1 1 1 1 1 1 b
00                 DEFB 0 0 0 0 0 0 0 0 b
00                 DEFB 0 0 0 0 0 0 0 0 b
FF                 DEFB 1 1 1 1 1 1 1 1 b
00                 DEFB 0 0 0 0 0 0 0 0 b
00                 DEFB 0 0 0 0 0 0 0 0 b
```

And now the program. First come three tables which will be constructed by the program later on:

```
           ORG E800
U_TABLE    DEFS 0280    Occupies addresses E800 to EA7F
L_TABLE    DEFS 60      Occupies addresses EA80 to EADF
S_TABLE    DEFS 20      Occupies addresses EAE0 to EAFF
```

The first subroutine is used to delete all unwanted spaces in the line being edited. This line resides in L_TABLE (Lower Screen Table).

```
                    ORG EB00
21E0EA  COMPRESS    LD HL,EAE0        HL: points one byte beyond
                                      L_TABLE.
3E20                LD A,"space"
065F                LD B,5F           B: = number of character
                                      positions to check.
2B      C_1         DEC HL            HL: points to next byte in
                                      L_TABLE.
BE                  CP (HL)           Is there a space at this
                                      location?
2003                JR NZ,C_2         Jump if a (non-space)
                                      character found.
10FA                DJNZ C_1          Repeat for whole file. (Note
                                      it is not necessary to check
                                      very first character).
C9                  RET               Exit if the file is full of
                                      spaces (except possibly for
                                      the first byte).
2E80    C_2         LD L,80           HL: points to first byte of
                                      L_TABLE.
0E01                LD C,01           C is 'space to be deleted'
                                      flag.
BE      C_3         CP (HL)           Is there a space at this
                                      location?
2015                JR NZ, C_5        Jump if not.
0D                  DEC C             Test 'space to be deleted'
                                      flag.
200E                JR NZ, C_4        Jump if space is not to be
                                      deleted.
C5                  PUSH BC
04                  INC B             B: = number of bytes to
                                      move.
E5                  PUSH HL
54                  LD D,H
5D                  LD E,L            DE: = address of space to
                                      be deleted.
23                  INC HL            HL: = address of next byte.
48                  LD C,B
0600                LD B,00           BC: = number of bytes to
                                      move.
ED80                LDIR              Delete space.
E1                  POP HL
2B                  DEC HL            HL: points to first
                                      (undeleted) space.
C1                  POP BC            B: = number of bytes left to
                                      check.
0E01    C_4         LD C,01           Set 'space to be deleted'
                                      flag.
1802                JR C_6
0E00    C_5         LD C,00           Reset flag (ie space not to
                                      be deleted).
23      C_6         INC HL            Point to next character
                                      along.
10E3                DJNZ C_3          Repeat for as many bytes
                                      as are necessary.
C9                  RET               End of subroutine.
```

The table S_TABLE (Spaces Table) stores a sequence of bytes, each of which is the low part of the address of a "space" character somewhere in L_TABLE. The job of this next subroutine is to insert 'C' spaces into L_TABLE at the address whose low part is stored at address HL. (ie insert 'C' spaces at address H * 100h + (HL).).

```
        ORG EB30
F5      INS_SPACE   PUSH AF
C5                  PUSH BC
D5                  PUSH DE
E5                  PUSH HL
6E                  LD L,(HL)         HL: = address of exisiting space.
E5                  PUSH HL           Stack this address.
2EDF                LD L,DF           HL: points to last byte of L_TABLE.
0600                LD B,00           BC: = number of spaces to insert.
A7                  AND A
ED42                SBC HL,BC         HL: points to last byte which will
                                      remain after insertion.
54                  LD D,H
5D                  LD E,L            DE: = address last byte to remain.
E1                  POP HL            HL: = address of existing space.
2B                  DEC HL
EB                  EX DE,HL
C5                  PUSH BC
E5                  PUSH HL
A7                  AND A
ED52                SBC HL,DE         HL: = number of bytes to move.
44                  LD B,H
4D                  LD C,L            BC: = number of bytes to move.
E1                  POP HL            HL: = address of last byte to
                                      remain.
11DFEA              LD DE,EADF        DE: points to last byte in L_TABLE.
EDB8                LDDR              Move required characters.
EB                  EX DE,HL          HL: points to last new position.
C1                  POP BC            BC: = number of bytes inserted.
41                  LD B,C            B: = number of bytes inserted.
3620    IS_LOOP     LD (HL),"space"   Overwrite next byte.
2B                  DEC HL            Point to next byte to overwrite.
10FB                DJNZ IS_LOOP      Repeat for each of the new
                                      positions.
E1                  POP HL            HL: points into S_TABLE.
E5                  PUSH HL
23      IS_SPACES   INC HL            Point to next address-low-part.
7E                  LD A,(HL)         A: = former low part of address of
                                      space.
FEA0                CP A0             Exit if not within the first 20h bytes.
3004                JR NC,IS_EXIT
81                  ADD A,C
77                  LD (HL),A         Update address pointer.
18F6                JR IS_SPACES      Repeat for all addresses.
E1      IS_EXIT     POP HL
D1                  POP DE
C1                  POP BC            Note that this subroutine leaves all
                                      registers unchanged.
F1                  POP AF
C9                  RET               End of subroutine.
```

A rather intricate subroutine now. The purpose of this subroutine is to insert spaces into the line being edited so that a single space occurs at the thirty-third position. Thus a complete word will end at the thirty second position, ensuring that right hand margins remain straight.

```
                    ORG EB68
010060  ADJUST      LD BC,0060        BC: = number of bytes in
                                      L_TABLE.
11E0EA              LD DE,EAE0        DE: points to start of S_TABLE.
2180EA              LD HL,EA80        HL: points to start of L_TABLE.
3E20    A_SEARCH    LD A,"space"
EDB1                CPIR              Search for next space.
2007                JR NZ,A_ST_DONE   Jump if no spaces left to find.
7D                  LD A,L
3D                  DEC A             A: = low part of address of
                                      space.
12                  LD (DE),A         Store in S_TABLE.
1C                  INC E             DE: points to next byte in table.
20F4                JR NZ,A_SEARCH    If room in table then repeat for
                                      next space.
1D                  DEC E             DE: = EAFF (Last byte of
                                      S_TABLE).
EB      A_ST_DONE   EX DE,HL          HL: points to last used byte in
                                      S_TABLE.
36FF                LD (HL),FF        Store end of table marker.
2EE0                LD L,E0           HL: points to first byte of
                                      S_TABLE.
7E                  LD A,(HL)         A: = low part of address of first
                                      space.
FE9F                CP 9F
D0                  RET NC            Return if there are no spaces
                                      within the first thirty-one bytes,
                                      since adjustment would be
                                      impossible.
47      A_SP_END    LD B,A            B: = low part of address of last
                                      space.
23                  INC HL            Point to next element of table.
7E                  LD A,(HL)         A: = low part of address of next
                                      space.
FEFF                CP FF             Check against end of file marker.
280D                JR Z,A_CH_2       Jump if end of file reached.
4F                  LD C,A            Temporarily store in C.
90                  SUB B             A: = distance between last two
                                      spaces.
3D                  DEC A             Set zero flag if there are two
                                      spaces in a row. (This will only be
                                      the case if the end of the text has
                                      been reached).
79                  LD A,C            Restore A.
2805                JR Z,A_CH_1       Jump if end of text reached.
FEA0                CP A0             Is there a space at the thirty third
                                      position?
C8                  RET Z             Return if so, since no adjustment
                                      is needed.
18EE                JR A_SP_END       Otherwise check next space.
36FF    A_CH_1      LD (HL),FF        Mark as end of file.
2EE1    A_CH_2      LD L,EI           HL: points to second element of
                                      S_TABLE.
3EA0                LD A,A0
BE                  CP (HL)
C8                  RET Z             Return if there is only one space
                                      in the first thirty two bytes, since
                                      adjustment would be impossible.
D8                  RET C
1E00                LD E,00
4E      A_NUMBER    LD C,(HL)         C: = low part of address of last
                                      space.
1C                  INC E             E: counts number of spaces.
23                  INC HL            Point to next space.
BE                  CP (HL)
```

```
30FA                    JR NC,A_NUMBER    Repeat for all spaces within first
                                          20h bytes.
91                      SUB C             A: = total number of spaces to
                                          insert.
0EFF                    LD C,FF
0C        A_MOD         INC C             C: calculates INT (number of
                                          spaces required/number of
                                          existing spaces in range).
93                      SUB E             A: records remainder of this
                                          division.
30FC                    JR NC,A_MOD       Note that A is adjusted once more
                                          than needed.
83                      ADD A,E           Restore A to true remainder.
57                      LD D,A            D: = remainder of division.
0C                      INC C
0D                      DEC C
2809                    JR Z,A_REMAIN     Jump if division equals zero.
43                      LD B,E            B: = number of existing spaces in
                                          range.
2EE0                    LD L,E0           HL: points to first element of
                                          S_TABLE.
CD30EB    A_SL_1        CALL INS_SPACE    Insert 'C' spaces.
23                      INC HL            Point to next element of
                                          S_TABLE.
10FA                    DJNZ A_SL_1       'E*C' spaces have now been
                                          inserted evenly.
14        A_REMAIN      INC D
15        A_SL_2        DEC D
C8                      RET Z             Task complete. Exit subroutine.
D5                      PUSH DE
2A765C                  LD HL,(SEED)      HL: = random number seed.
54                      LD D,H
5D                      LD E,L
29                      ADD HL,HL         Multiply by 2 . . .
29                      ADD HL,HL         4 . . .
19                      ADD HL,DE         5 . . .
29                      ADD HL,HL         A . . .
29                      ADD HL,HL         14 . . .
29                      ADD HL,HL         28 . . .
19                      ADD HL,DE         29.
22765C                  LD (SEED),HL      Store new random number seed.
D1                      POP DE            Restore D and E.
7C                      LD A,H            A: = random number.
93        A_RANDOM      SUB E
20FD                    JR NC,A_RANDOM
83                      ADD A,E           A: = random number between 0
                                          and 'E-1'.
C6E0                    ADD A,E0
6F                      LD L,A
26EA                    LD H,EA           HL: points to random element of
                                          S_TABLE.
0E01                    LD C,01           C: = number of spaces to insert.
CD30EB                  CALL INS_SPACE    Insert space.
18DC                    JR A_SL_2         Correct number of spaces have
                                          now been inserted, distributed
                                          more or less evenly.
```

By contrast, the next few subroutines are all really easy to follow. The job of this one is to copy text from L_TABLE to the lower part of the screen. Note that the system variable (DF_SZ) is assumed to be 04, not 02.

```
                        ORG EBE5
21A050    TRANSFER_L    LD HL,50A0        HL: = print position on screen.
22865C                  LD (DFCCL),HL     Store print position.
212117                  LD HL,1721        HL: = screen coordinates.
228A5C                  LD (SPOSNL),HL    Store coordinates.
FD360201                LD (TVFLAG),01    Direct PRINT to lower part of
                                          screen.
2180EA                  LD HL,EA80        HL: = points to start of
                                          L_TABLE.
0640                    LD B,40           B: = number of bytes to print.
7E        TL_PRINT      LD A,(HL)         A: = next character to print.
23                      INC HL            Point to next character to print.
D7                      RST 10            Print character.
10FB                    DJNZ TL_PRINT     Repeat for 40h characters.
3AB15C                  LD A,(L_CURSOR)   A: = low part of address of
                                          cursor in L_TABLE.
C620                    ADD A,20          A: = low part of address of
                                          cursor in attributes file.
6F                      LD L,A
265A                    LD H,5A           HL: = address of cursor in
                                          attributes file.
7E                      LD A,(HL)         A: = attribute at that address.
EE3F                    XOR 3F            Complement the colours.
77                      LD (HL),A         Store new attribute to indicate
                                          cursor.
C9                      RET
```

Notice that the subroutine above makes use of a program variable called L_CURSOR which is one byte long and lives at 5CB1. It stores the low part of the address of the cursor within the edit-line (in L_TABLE). There is another variable used in the program and this is called U_CURSOR (Upper Cursor) which is two bytes long, and stores the address of a second cursor — this time within U_TABLE. It is always at the left hand edge of the screen. Its address is 5CAF, and it is made use of by this next subroutine, which is called TRANSFER_U. The purpose of this subroutine is very similar to the last one – copies text from U_TABLE the upper part of the screen:

```
                        ORG EC0C
210040    TRANSFER_U    LD HL,4000          HL: = print position on scre
22845C                  LD (DF_CC7,HL       Store print position.
212118                  LD HL,1821          HL: = on-screen coordinat
22885C                  LD (S_POSN),HL      Store coordinates.
FD360200                LD (TVFLAG),00      Direct PRINT to upper part
                                            screen.
2100E8                  LD HL,E800          HL: = points to first byte of
                                            U_TABLE.
013080                  LD BC,8003          B: = 80 and C: = 03
7E        TU_PRINT      LD A,(HL)           A: = next character to print
23                      INC HL              Point to next character to p
D7                      RST 10              Print character.
10FB                    DJNZ TU_PRINT       Repeat for either 80 or 100
                                            characters. B: = 00 (effecti
                                            100).
0D                      DEC C
20F8                    JR NZ,TU_PRINT      Total 0280 bytes in all.
2AAF5C                  LD HL,(U_CURSOR)    HL: = points to cursor positi
                                            in U_TABLE.
7C                      LD A,H              A: = high part.
D690                    SUB 90
67                      LD H,A              HL: = points to cursor posit
                                            in attributes file.
3A8D5C                  LD A,(ATTR_P)       A: = attribute normally use
                                            screen.
EE3F                    XOR 3F              Complement the colours.
          WIPE_LINE     $                   See below.
```

This subroutine leads straight into a routine called WIPE_LINE which will be used quite a lot by other parts of the program. It pokes the byte held by the A register into 20h consecutive locations. In the above case it is used to complement the colou of one row of the upper part the screen at the curs position. It may also be call from the label WIPE, in whi case the number of locations be poked is BC + 1.

```
                        ORG EC36 .
011F00    WIPE_LINE     LD BC,001F          BC: = number of locations
                                            poke, less one.
54        WIPE          LD D,H
5D                      LD E,L              DE: = address of first locat
23                      INC DE              DE: = address of second
                                            location.
77                      LD (HL),A           Poke first location.
EDB0                    LDIR                Poke remaining locations.
C9                      RET
```

The next subroutine is the CLEAR SCREEN subroutine which is accessed upon running by caps shift 4. You should able to follow it with no furth explanation from me:

```
                        ORG EC40
2100E8    CLEAR_SCREEN  LD HL,E800          HL: = points to first byte of
                                            U_TABLE.
22AF5C                  LD (U_CURSOR),HL    Reset upper cursor to top li
3E80                    LD A,80             A: = low part of address of
                                            first byte of L_TABLE.
32B15C                  LD (L_CURSOR),A     Reset lower cursor to start
                                            line.
01DF02                  LD BC,02DF          BC: = the number of bytes
                                            U_TABLE and L_TABLE
                                            combined, less one.
3E20                    LD A,"space"
CD39EC                  CALL WIPE           Fill both tables with spaces
CD0CEC                  CALL TRANSFER_U     Blank upper part of screen.
C3E5EB                  JP TRANSFER_U       Blank lower part of screen a
                                            exit.
```

Now things start getting really easy. This is the CURSOR LEFT routine:

```
                        ORG EC59
3AB15C    LEFT          LD A,(L_CURSOR)     A: = address of cursor (low
                                            part).
FE80                    CP 80               Is cursor already at left of li
C8                      RET Z               Return if so.
FD3577                  DEC (L_CURSOR)      Otherwise move cursor left
C9                      RET                 And return.
```

And with amazing similarity:
CURSOR RIGHT:

```
                        ORG EC63
3AB15C   RIGHT          LD A,(L_CURSOR)      A:= address of cursor (low
                                             part).
FEBF                    CP BF                Is cursor already at right of
                                             line?
C8                      RET Z                Return if so.
FD3477                  INC (L_CURSOR)       Otherwise move cursor right.
C9                      RET                  And return.
```

This is the CURSOR UP routine:

```
                        ORG EC6D
2AAF5C   UP             LD HL,(U_CURSOR)     HL:= address of cursor.
1100E8                  LD DE,E800           DE:= address of topmost
                                             allowable position.
A7                      AND A
ED52                    SBC HL,DE            Is cursor already at top?
C8                      RET Z                Return if so.
11E0FF                  LD DE,FFE0           DE:= vertical displacement up
                                             one line.
180D                    JR DOWN_UP           Move cursor up.
```

And, as you'd expect, the CURSOR DOWN routine:

```
                        ORG EC7C
2AAF5C   DOWN           LD HL,(U_CURSOR)     HL:= address of cursor.
1160EA                  LD DE,EA60           DE:= lowest position
                                             allowable.
A7                      AND A
ED52                    SBC HL,DE            Is cursor already at bottom?
C8                      RET Z                Return if so.
112000                  LD DE,0020           DE:= vertical displacement
                                             down one line.
2AAF5C   DOWN_UP        LD HL,(U_CURSOR)     HL:= address of cursor.
19                      ADD HL,DE            Compute new position.
22AF5C                  LD(U_CURSOR),HL      Store new position.
C30CEC                  JP TRANSFER_U        Print screen showing cursor in
                                             new position.
```

Now we come to the EDIT function. This too is quite straightforward.

```
                        ORG EC93
2AAF5C   EDIT           LD HL,(U_CURSOR)     HL:= address of upper cursor.
1180EA                  LD DE,EA80           DE:= address of first byte of
                                             L_TABLE.
FD7377                  LD (L_CURSOR),E      Move lower cursor to left of
                                             line.
012000                  LD BC,0020           BC:= number of bytes in one
                                             line.
79                      LD A,C               A:= "space".
EDB0                    LDIR                 Copy line into L_TABLE.
0E3F                    LD C,3F              BC:= number of bytes to
                                             erase, less one.
EB                      EX DE,HL             HL:= address of first byte to
                                             erase.
1892                    JR WIPE              Erase remainder of L_TABLE.
```

Now we come to the CAPS LOCK function. This relies upon the fact that the L mode/C mode is stored by the ROM as bit three of the system variable FLAGS2. This is reset for L mode, or set for C mode.

```
                        ORG ECA7
3A6A5C   CAPS_LOCK      LD A,(FLAGS_2)       Fetch FLAGS_2.
EE08                    XOR 08               Complement bit three.
326A5C                  LD (FLAGS_2),A       Store ammended variable.
C9                      RET
```

Easier and easier eh? The next subroutine is the COPY function which is used by the program to copy the top nineteen lines of the screen onto the ZX printer.

```
                        ORG ECB0
F3       COPY_13        DI                   This is because COPY won't
                                             work if the interrupts are
                                             enabled.
0698                    LD B,98              B:= number of rows to copy.
                                             (Note: eight rows equals one
                                             line).
C3AF0E                  JP COPY_B            Jump into ROM COPY routine.
                                             Note that this routine
                                             automatically re-enables the
                                             interrupts.
```

Next comes the CLEAR LINE routine, the purpose of which is to erase (ie overwrite with spaces) one line of text from the upper part of the screen at the cursor position.

```
                        ORG ECB6
2AAF5C   CLEAR_LINE     LD HL,(U_CURSOR)     HL:= points to upper cursor
                                             position.
3E20                    LD A,"space"
CD36EC                                       CALL WIPE_LINE
                                             Erase line as required.
C30CEC                  JP TRANSFER_U        Re-print upper screen with line
                                             erased.
```

It is at this point that things start getting a little more intricate. This is the DELETE routine:

```
                        ORG ECC1
CD59EC   DELETE         CALL CURSOR_LEFT     Move cursor left, if possible.
C8                      RET Z                Return if cursor at left of line.
6F                      LD L,A
26EA                    LD H,EA              HL:= previous address of
                                             cursor.
5F                      LD E,A
1D                      DEC E
54                      LD D,H               DE:= new address of cursor.
2F                      CPL
D61F                    SUB 1F               A:= number of bytes to
                                             move.
4F                      LD C,A
0600                    LD B,00              BC:= number of bytes to
                                             move.
EDB0                    LDIR                 Byte no deleted.
3E20                    LD A,"space"
12                      LD (DE),A            Erase final character in
                                             L_TABLE.
```

Next comes an exciting part! This is the CHARACTER routine, which controls what happens when any character in the range 20 to 80 is given. The character in question starts its life (as far as this subroutine is concerned) in the A register.

```
                        ORG ECD7
F5       CHR            PUSH AF              Stack character to add.
3AB15C                  LD,A(L_CURSOR)       A:= cursor position.
21E1EA                  LD HL,EAE1           HL:= points to second byte
                                             of S_TABLE.
36FF                    LD (HL),FF           Store an end of file marker.
2B                      DEC HL               HL:= points to first byte of
                                             S_TABLE.
77                      LD (HL),A            Store cursor position.
0E01                    LD C,01              C:= number of bytes to
                                             insert.
CD30EB                  CALL INS_SPACE       Insert one space at desired
                                             location.
FD6E77                  LD L,(L_CURSOR)      HL:= address of cursor.
F1                      POP AF               A:= character to add to file.
77                      LD (HL),A            Store character at correct
                                             point.
CD63EC                  CALL CURSOR_RIGHT    Move cursor right for next
                                             character.
2806                    JR Z,PROCESS         Jump forward if at right of
                                             line.
3ABFEA                  LD A,(EABF)          A:= thirty second character
                                             in file.
FE20                    CP "space"
C8                      RET Z                If this is a space then routine
                                             finished.
         PROCESS        $                    Otherwise . . .
```

Are you ready? This is the main processing routine. It may also be called from the labels PROCESS_1 and PROCESS_2. Please pay careful attention to what happens here:

```
                        ORG ECF7
CD00EB   PROCESS        CALL COMPRESS        Remove all unwanted
                                             spaces.
CD68EB   PROCESS_1      CALL ADJUST          Line up right hand margin.
2180EA   PROCESS_2      LD HL,EA80           HL:= points to first byte of
                                             L_TABLE.
ED5BAF5C                LD DE,(U_CURSOR)     DE:= address of upper
                                             cursor.
012000                  LD BC,0020           BC:= number of
                                             characters in one line.
EDB0                    LDIR                 Transfer one line to upper
                                             screen.
E5                      PUSH HL              Stack the constant EAA0
CD7CEC                  CALL CURSOR_DOWN     Move upper cursor down if
                                             possible.
E1                      POP HL               HL:= points to first byte of
                                             second line.
```

```
1180EA                    LD DE,EA80            DE: = points to first byte of
                                                first line.
014000                    LD BC,0040            BC: = number of bytes to
                                                move.
EDB0                      LDIR                  Delete top line from
                                                L_TABLE.
3E20                      LD A,"space"
EB                        EX DE,HL              HL: = points to third line of
                                                L_TABLE.
CD36EC                    CALL WIPE_LINE        Erase last line.
2100EA                    LD HL,EAC0            HL: = points to start of
                                                third line of L_TABLE.
0640                      LD B,40               B: = number of bytes in
                                                first two lines.
2B          PR_LOOP       DEC HL                Point to next byte along.
BE                        CP (HL)               Is it a space?
2003                      JR Z,PR_CURSOR        Jump forward if not.
10FA                      DJNZ PR_LOOP          Try again for next byte.
2B                        DEC HL                HL: = EA7F.
23          PR_CURSOR     INC HL                HL: = new address of
                                                cursor.
7D                        LD A,L                A: = low part of this
                                                address.
32B15C                    LD (L_CURSOR),A       Store new cursor position.
C9                        RET
```

Next we have the NEW PARAGRAPH routine — this is what happens when you hit the ENTER key. See if you can follow it.

```
                          ORG ED2E
CD00EB      ENTER         CALL COMPRESS         Delete unwanted spaces.
21C0EA                    LD HL,EAC0            Point HL beyond all text in
                                                L_TABLE.
3E20                      LD A,"space"
2B          E_CHECK       DEC HL                Point to next character.
BE                        CP (HL)               Is it a space?
28FC                      JR Z,E_CHK            Loop back if so.
7D                        LD A,L                A: = low part of address of
                                                last (non-space) character
                                                in file.
FEA0                      CP A0                 Is it on the first line?
D4FAEC                    CALL NC,PROCESS_1     If not then process one line
                                                from the lower part to the
                                                upper part of the screen.
CD00EB                    CALL COMPRESS         Now delete any excess
                                                spaces generated by the
                                                above instruction.
CDFDEC                    CALL PROCESS_2        Copy final part of
                                                L_TABLE to screen, but
                                                without alligning the right
                                                hand margin.
CDB6EC                    CALL CLEAR_LINE       Make one blank line below
                                                paragraph.
2AAF5C                    LD HL,(U_CURSOR)      HL: = address of upper
                                                cursor position.
3680                      LD (HL),"solid space" The program will later
                                                recognise this as an end of
                                                paragraph marker.
2180EA                    LD HL,EA80            HL: = points to first byte
                                                (now blank) L_TABLE.
0603                      LD B, 03              B: = number of spaces to
                                                indent start of next
                                                paragraph.
3680        E_INDENT      LD (HL),"solid space" The paragraph is indented
                                                with solid spaces which will
                                                not be deleted by the
                                                COMPRESS subroutine.
23                        INC HL                Point to next byte.
10FB                      DJNZ E_INDENT         Repeat for three spaces.
FD7577                    LD (L_CURSOR),L       Store indented cursor
                                                position.
C37CEC                    JP CURSOR_DOWN        Move cursor down below
                                                blank line, and exit.
```

That was a mouthful wasn't it? Our tale continues now with a table of addresses. This will be used later on by the program when it works out what subroutine it wants to call.

```
                      ORG ED5E
B6EC    CTRL_TABLE    DEFW CLEAR_LINE
40EC                  DEFW CLEAR_SCREEN
A7EC                  DEFW CAPS_LOCK
93EC                  DEFW EDIT
59EC                  DEFW CURSOR_LEFT
63EC                  DEFW CURSOR_RIGHT
7CEC                  DEFW CURSOR_DOWN
6DEC                  DEFW CURSOR-UP
C1EC                  DEFW DELETE
2EED                  DEFW ENTER
1EEE                  DEFW YOURS
B0EC                  DEFW COPY_13
```

And now for the moment you've all been waiting for — this is the program which ties all those subroutines together into one unified program. *When you call the program from BASIC this is the address you must refer to.* This is the very start of the proceedings. Note that because the program at one point relies on the value of the system variable SEED being fairly random th you shouldn't really use RA DOMISE USR 60790. Instea you can always use RA DOMISE 0 * USR 60790, or L L = USR 60790, or even own favourite little quirky odd IF USR 60790 THEN (wi nothing after the word THE Anyway: here it is — this where it's all at!

```
                          ORG ED76
218050      START         LD HL,5080            This is the print position for th
                                                start of the twenty-first line o
                                                the screen.
22865C                    LD (DFCCL),HL         Set print position.
212118                    LD HL,1821            Define coordinates as start of
                                                line.
228A5C                    LD (SPOSNL),HL        Store coordinates.
FD363104                  LD (DF_SZ),04         Specify lower screen four line
                                                wide.
FD360201                  LD (TVFLAG),01        Direct PRINT to lower part of
                                                screen.
0680                      LD B,80               B: = number of bytes in lowe
                                                part of screen.
3E90        ST_LOOP       LD A,"graphic A"
D7                        RST 10                Print border surrounding lowe
                                                display.
10FB                      DJNZ ST_LOOP
CD40EC                    CALL CLEAR_SCREEN     Clear screen and set up curso
            LOOP          $                     Wait and see . . . .
```

The next bit is the main loop. Every time an action is carried out control will return to this point. The first things is to scan the keyboard. Let's see how it goes:

```
                          ORG ED94
FDCB01AE    LOOP          RES 5,(FLAGS)         Signal 'last keystroke has bee
                                                acted upon'.
CDE5EB                    CALL TRANSFER_L       Display the result of the last
                                                action.
FDCB016E    L_WAIT        BIT 5,(FLAGS)         Test for new keystroke.
28FA                      JR Z,L_WAIT           Wait until new key accepted.
                                                (Note: this is not an infinite loo
                                                since the keyboard scanning
                                                procedure is done by the ROM
                                                interrupt routine).
3A085C                    LD A,(LAST_K)         A: = INKEY$ (effectively).
FEC7                      CP "symbol shift Q"   Symbol shift Q is interpreted a
                                                "paragraph reform" command
2836                      JR Z,REFORM
FEC9                      CP "symbol shift W"   Return to BASIC if "symbol sh
                                                W" pressed.
C8                        RET Z
FEC8                      CP "symbol shift E"
2002                      JR NZ,L_1
3E7F                      LD A,"©"              Symbol shift E becomes the
                                                copyright symbol.
FEAC        L_1           CP "symbol shift I"
2002                      JR NZ,L_2
3E80                      LD A,"solid space"    Symbol shift I becomes the
                                                "graphic 8" character.
FE20        L_2           CP 20
300F                      JR NC,L_3             Jump forward unless a contro
                                                character is given.
87                        ADD A,A               Mulitoply code by two.
C656                      ADD A,56              The quantity 56 is CTRL_TAB
                                                low minus 08.
6F                        LD L,A
26ED                      LD H,ED               HL: = points to address of
                                                subroutine to call.
5E                        LD E,(HL)
23                        INC HL
56                        LD D,(HL)             DE: = address of subroutine to
                                                call.
EB                        EX DE,HL              HL: = address of subroutine to
                                                call.
CD2C16                    CALL (HL)             Call the required subroutine.
18CA                      JR LOOP               And re-join main loop.
```

Note: The 'instruction' CALL (HL) is not strictly speaking a true machine code instruction. It CALLS a 'subroutine' in the ROM consisting of the single instruction JP (HL). Think about it . . . .

/ random then
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's use RAN-
50790, or LET
or even my
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CTRL_TABLE

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```
FE81     L_3        CP81
3808                JR C,L_4           Jump forward unless an 'E-mode'
                                       character is required.
216A02              LD HL,026A         HL: = points to SYMBOL SHIFT
                                       LETTER table in ROM.
45                  LD B,L             BC: = any large number.
ED81                CPIR               Locate given character.
7D                  LD A,L
D625                SUB 25
6F                  LD L,A             HL: = points to required
                                       character.
7E                  LD A,(HL)          A: = required charcter.
CD07EC   L_4        CALL CHARACTER     Add character to S_TABLE (etc).
1886                JR LOOP
```

This next section is the PARAGRAPH REFORM function, and it is this which makes our word processor so powerful. To change a word or phrase just use EDIT to get the appropriate line; make the change; and then without moving the upper cursor press ''symbol shift Q'' and the whole paragraph will be reconstructed before your eyes. This is the machine code that performs that task:

```
                    ORG EDDE
11C0EA   REFORM     LD DE,EAC0         Point DE beyond all text in
                                       L_TABLE.
1B       R_FIND     DEC DE             Point to next byte.
1A                  LD A,(DE)          A: = next character in file.
FE20                CP ''space''
28FA                JR Z,R_FIND        Loop back until non-space
                                       character found.
13                  INC DE             Skip over character.
13                  INC DE             Skip over following space.
2AAF5C              LD HL,(U_CURSOR)   HL: = points to address of upper
                                       cursor.
012000              LD BC,0020         BC: = number of bytes in one
                                       line.
EDB0                LDIR               Append line from upper screen
                                       to edit-line.
CD00EB              CALL COMPRESS      Delete all unwanted spaces.
21E0EA              LD DL,EAE0         Point HL just beyond L_TABLE.
3E20                LD A,''space''
2B       R_FIND_2   DEC HL             Point to next byte.
BE                  CP (HL)            Is it a space?
28FC                JR Z,R_FIND_2      Loop back until non-space
                                       character found.
7D                  LD A,L             A: = low part of address of last
                                       character in file.
FEA0                CP A0
3815                JR,R_EXIT          Jump if text will fit on just one
                                       line.
CDFAEC              CALL PROCESS_1     Process one line and transfer to
                                       upper screen.
2AAF5C              LD HL, (U_CURSOR)  HL: = new address of upper cur-
                                       sor.
7E                  LD A,(HL)
FE80                CP ''solid space'' Test for end of paragraph.
280D                JR Z,R_EXIT        Exit if end of paragraph found.
1160EA              LD DE,EA60         DE: = lowest allowable position
                                       of cursor.
A7                  AND A
ED52                SBC HL,DE
2805                JR Z,R_EDIT        Exit if bottom of screen reached.
18C6                JR REFORM          Repeat for next line.
CD2EED   R_EXIT     CALL ENTER         Treat as end of paragraph.
C394ED              JP LOOP            And back into main loop.
```

The next, final piece of machine code is somewhere in your head. What would you like a word processor to do that this one doesn't? This subroutine is YOUR subroutine. It will be carried out every time ''symbol shift'' and ''caps shift'' are pressed simultaneously. You could, for instance, then wait for a further key and offer a choice of different functions. Or maybe there's just one function you want to add. Whatever you choose — this one is truly up to you. It's all yours . . . .

Editor's note

We would like to point out that Toni Baker's excellent book 'Mastering Machine Code on Your Spectrum', recently published, is in no way connected with this series which has been specially written for ZX Computing.

Countdown

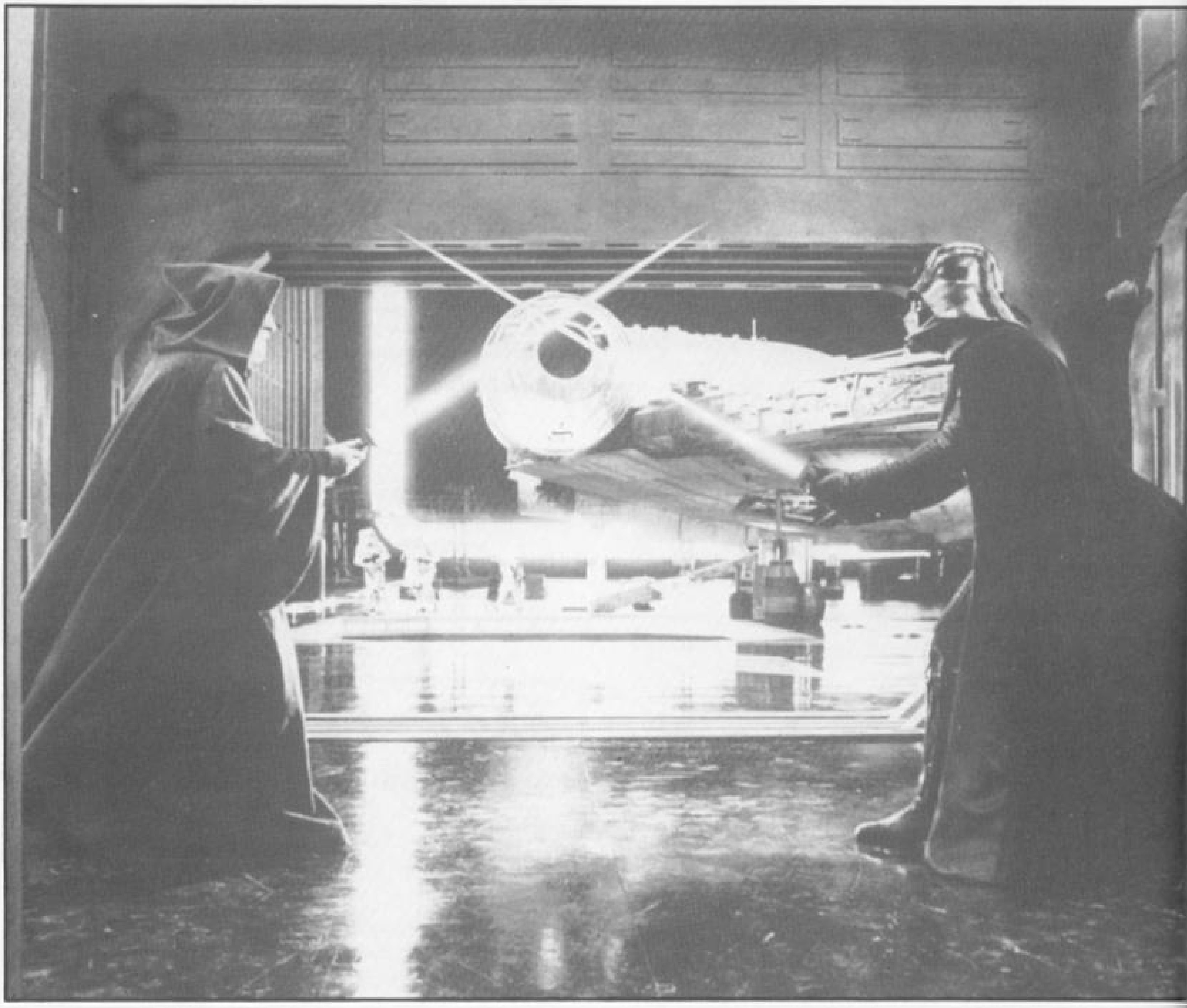
Now you can play TV's popular game with your friends and your micro — thanks to Ben Rimmer who hails from Suffolk.

This game is for two players who take it in turn to choose nine random letters (consonants and vowels) which are displayed on the screen. When the music starts, the players have 30 seconds in which to try and form as long a word as possible from the letters displayed. When the music ends, the letters disappear and the players must stop and enter the number of letters they have used and their scores. When the match has come to an end, the overall winner is announced.



```
   1 REM "COUNTDOWN"
   2 BORDER 3: PAPER 6: CLS : IN
PUT "How many games would you li
ke ?",s
   3 LET z=0: LET y=0
   4 BORDER 2: PAPER 3: INK 7: C
LS
   6 PRINT AT 1,10;"Countdown"
   7 INPUT "Who is playing?",n$,
m$
   8 FOR f=1 TO s: PRINT AT 1,10
;"Countdown"
   9 LET a=10
  10 FOR n=1 TO 9: BORDER RND*6
  11 IF n=10 THEN GO TO 70
  12 INPUT "consonant or vowel?(
c or v)",c$
  20 LET a$="bcdfghjklmnpqrstvwx
yz"
  25 LET b$="aeiou"
  30 IF c$="v" THEN GO TO 62
  31 IF c$=" STOP " THEN STOP
  32 IF c$<>"v" AND c$<>"c" AND
c$<>" STOP " THEN GO TO 12
  40 LET x=INT (21*RND)+1
  50 PRINT AT 11,a;a$(x);
  55 LET a=a+1
  56 PAUSE 20
  60 NEXT n
  61 IF n=10 THEN GO TO 70
  62 LET x=INT (5*RND)+1
  63 PRINT AT 11,a;b$(x);
  64 LET a=a+1
  65 PAUSE 20
  66 NEXT n
  70 FOR n=1 TO 7
  80 BEEP 0.2,1: BEEP 0.1,1: BEE
P 0.2,13: BEEP 0.1,1: BEEP 0.2,1
3
  90 BORDER RND*6: NEXT n
 100 BEEP 0.2,1: BEEP 0.1,1: BEE
P 0.2,13: BEEP 0.1,1. BEEP 0.1,1
3: BORDER RND*6
 110 BEEP 0.1,13: BORDER RND*6
 150 FOR n=1 TO 7
 160 BEEP 0.2,3: BEEP 0.1,3: BEE
P 0.2,15: BEEP 0.1,3. BEEP 0.2,1
5
 170 BORDER RND*6: NEXT n
 180 BEEP 0.2,3: BEEP 0.1,3: BEE
P 0.2,15: BEEP 0.1,3: BEEP 0.1,1
5: BORDER RND*6
 190 BEEP 0.2,15
 200 FOR n=1 TO 8
 210 BEEP 0.2,3: BEEP 0.1,3: BEE
P 0.2,15: BEEP 0.1,3: BEEP 0.2,1
5
 220 BORDER RND*6: NEXT n
 230 FOR n=1 TO 150: BORDER RND
6: NEXT n
 240 FOR n=1 TO 2
 250 BEEP 0.2,3. BEEP 0.1,3. BE
P 0.2,15: BEEP 0.1,3: BEEP 0.2,
5
 260 BORDER RND*6: NEXT n
 270 BEEP 0.1,15: BEEP 0.1,13:
OR n=1 TO 20: NEXT n: BEEP 0.1,
: BEEP 0.1,10. FOR n=1 TO 20: N
XT n: BEEP 0.1,3. BEEP 0.1,6. B
EP 0.1,3: BEEP 0.1,6: BORDER RN
*6
 272 PRINT AT 11,10;"
 275 PAUSE 0
 276 PRINT TAB 6;"What did ";n$
" score?": INPUT c
 277 PRINT TAB 6;"What did ";m$
" score?": INPUT b
 278 LET y=y+c: LET z=z+b
 279 CLS
 280 NEXT f
 285 CLS : PRINT AT 11,10;n$;"
cored ";y: PRINT AT 12,10;m$;"
cored ";z
 290 IF y>z THEN PRINT TAB 10;n
;" won!"
 300 IF y=z THEN PRINT TAB 10;"
Dead heat!"
 310 IF z>y THEN PRINT TAB 10;m
;" won!"
 320 PAUSE 0
 330 RUN
```

Home base



Get back home as soon as you can in this program for the Spectrum, courtesy of David Naylor of Leeds.

The object of this game is to move your spacecraft from the bottom left-hand corner of the screen to the top of the screen, your home base. However, there are two problems you will encounter. Firstly, the gateway through which you can escape to your home base is getting smaller as you progress up the screen. And also there are a number of obstacles which get in your way.

On the level

Once the program has been entered and RUN, you are given scoring and skill level instructions, and which keys you use to move. If you do not press a key, your spacecraft will always move forward, and you score points for moving forwards, left and right. There are certain objects scattered around the screen, such as shooting stars, power packs and flying saucers, for which you will gain extra points if you collect them. You can also gain extra lives should you collect these objects but you can only achieve a total of nine lives.

There are seven skill levels; the level of the game is displayed at the top of the screen along with the score, the high score, the amount of time you have left and the number of lives you have left. The skill level is related to the number of obstacles you have in your path and the time you have left to get through the gateway at the top of the screen before it completely closes.

The gateway to your home base will close, bit by bit, until it completely closes thus trapping you in the playing area. The rate at which this happens is related to the main playing loop — so the longer you stay in the playing area collecting more points, the more difficult it is to get back to your home base.

One special feature included in this program is the one for choosing the skill level you wish to start on. You can either choose the level you start on and

specify a new level when you have completed your mission. Or you can choose to start at level one and progress through the subsequent levels (assuming you manage to do that!) automatically.

One little problem I ran into when writing this program was that I had related the closing of the gateway at the top of the screen to the number of points you have. Thus, in some of my earlier versions of the game, when you went onto a second level having completed the first, the computer looked at the score you had amassed and shut the gateway instantly not giving you a chance at all. Therefore, I included the variable, SCS, which holds your score from previous rounds and is added onto the score you gain from each level. Thus, while you play each level your score is reset to zero so that the gateway to your home base does not close before you move.

Variables

HI	The high score.
SCS	The scores.
SC	The score from each individual level.
L	The number of lives you have.
DI	The level of difficulty you have chosen.
I$	The type of difficulty set on that level.
S and K	Random numbers used for the initial plotting.
W	The main loop and time allowed.
X	The random number used in the closing of the gateway.
C and R	These are used for plotting the spacecraft movement.
Z and X	These are used for plotting the obstacles in the main program loop.
N	Used (in grahics mode) for the spacecraft's user-defined graphics.

Line by line

Line 5	Fixes the user-defined graphics.
Lines 45-80	Provide the instructions and inputs.
Line 90	Fixes the number of lives you have.
Lines 115-158	Deal with the initial plotting of the obstacles.
Lines 160	Sets up the initial position of the spacecraft.
Lines 170-190	Print the special objects to be collected at random positions.
Line 210	Prints the destination of your spacecraft.
Lines 295-500	Contain the main loop of the program. The length of the main loop is determined by the skill level and this then counts as the time allowed to complete the level (variable, W).
Line 303	Prints the new position of the spacecraft.
Lines 323-345	Close the gateway to the home base with random number, X.
Lines 349-365	Control the movement of the spacecraft.
Lines 369-376	Scan the position of the spacecraft to see what's there. Touching the home base barrier destroys you immediately.
Line 379	The computer already knows if you have touched the home base barrier and has dealt with it. Therefore, this line sends you to line 2000 if you have reached the top of the screen.
Lines 380-392	Choose the random numbers (X and Z) and plot an obstacle at the points, X and Z. They also make sure nothing is printed over the various displays at the top of the screen.
Lines 1000-1005	If you run out of lives and crash, this prints a final message accompanied by a series of BEEPs.
Lines 1010-1030	Ask you if you want to play again and check to see if the high score facility needs altering to a higher number.
Lines 1100-1115	Tell you if you have run out of time and then goes to line 1010 to see if you want to play again.
Lines 2000-2060	Tell you when you win, print the 'SCS' score, check what type of game you are playing and direct the program to line 80 or 90. If you are progressing from level to level up to level seven, you will receive a special message.
Lines 3000-3020	Tell you when your score gets too high and the home base disappears. The program is then directed to line 1010 to see if you would like another game.
Lines 5040-6000	Set the user-defined graphics.
Lines 7000-7400	Provide instructions on scores and lives from lines 369-376.

Points to note

After entering the program, you can save the program using the following:

SAVE "HOME BASE" LINE 5

If you touch a key during the initial setting-up of the obstacles, when the plotting is finished the 'PAUSE O' in line 240 will not operate and the game will begin immediately.

Finally, don't get too worried if on the higher levels you are boxed in by obstacles as soon as you start as you should have enough lives in hand to be able to cross a few obstacles; you only lose one life each time you go over an obstacle. Be sure to plan your route through the obstacles before you start the game though.

```
   1 REM HOME BASE
   5 GO SUB 5050: GO TO 8
   8 PAPER 7: CLS
  10 LET HI =0
  15 LET SCS=0
  45 REM instructions
  49 PRINT AT 21,6; BRIGHT 1;"DA
VID NAYLOR    1983"
  50 PRINT AT 9,0; INK 1; BRIGHT
 1;"
     H * O * M * E    B * A * S
* E
"
  52 FOR R=1 TO 20: BEEP .05,R:
BEEP .01,R+10: BEEP .001,R-20: N
EXT R
  65 PAUSE 50: CLS : PRINT AT 0,
0;"SCORING :
   2,4,6,8,10,12,14pts depending
 on level for moving:forwards
                     left
                     right
    50pts for a shooting star(*)
          for a star(.)
   100pts for a power pack(#)
   150pts for a flying saucer(↑)
   200pts on completing return

   SKILL LEVELS:
   1...50*(█) ,350 secs
   2..100*(█) ,175 secs
   3..150*(█) ,113 secs
   4..200*(█) , 85 secs
   5..250*(█) , 70 secs
   6..300*(█) , 58 secs
   7..350*(█) , 50 secs"
  72 PRINT AT 21,9;"PRESS A KEY"
: PAUSE 0: CLS : PRINT AT 5,0;"U
SE                              '
0' FOR LEFT                     '
9' FOR RIGHT                    '
1'FOR DOWN
YOU MOVE FORWARDS AUTOMATICALLY"

  75 PRINT AT 21,5;"PRESS A KEY
TO START": PAUSE 0: CLS
  77 INPUT "IF YOU WISH SKILL  L
EVELS  TO   BUILD UP AUTOMATICAL
LY(1 TO 7), THEN PRESS 'a'.";l$
  78 IF l$="a" THEN LET DI=1: GO
 TO 88
  80 INPUT "LEVEL OF DIFFICULTY(
1-7)";DI
  85 IF DI<1 OR DI>7 THEN GO TO
80
  88 LET SC=0
  90 LET L=DI*2
  95 IF L>9 THEN LET L=9
 102 BORDER 1: PAPER 4: CLS
 115 REM initial plotting
```

```
 120 PRINT AT 0,9;"PLEASE  WAIT"
 140 FOR Q=0 TO 50*DI
 145 LET S=INT (RND*31): LET K=I
NT (RND*21)+3
 147 IF K>21 THEN LET K=21
 150 PRINT AT K,S;"X"
 152 BEEP .05,RND*50
 153 IF Q=50*DI THEN GO TO 160
 155 PRINT AT 21,0;" "
 158 NEXT Q
 160 LET R=21: LET C=0
 170 PRINT AT RND*17+3,RND*31;"#
"
 175 PRINT AT RND*17+3,RND*31;".
"
 180 PRINT AT RND*17+3,RND*31;"↑
"
 190 PRINT AT RND*17+3,RND*31;"*
"
 205 PRINT AT 0,5;"PRESS ANY KEY
 TO MOVE"
 210 PRINT AT 2,0;" H * O * M *
E    B * A * S * E   "
 235 PRINT AT R,C;"N"
 240 PAUSE 0
 250 PRINT AT 0,0; INVERSE 1;"

                               "
 290 PRINT AT R,C;" "
 295 REM set up loop
 300 FOR W=1 TO INT 350/DI
 302 IF W=INT 350/DI THEN GO TO
1100
 303 PRINT AT R,C;"N"
 304 IF L>9 THEN LET L=9
 306 REM scoring/timing/lives
 307 PRINT AT 0,25; INVERSE 1;"L
IVES:";L
 309 PRINT AT 0,12;"LEVEL:";DI
 312 PRINT AT 0,0; INVERSE 1;"SC
ORE:";SC
 313 IF HI <SC THEN LET HI = SC
 316 PRINT #2; INVERSE 1;"HI SCO
RE:";HI
 320 REM random gate close
 323 LET X=INT (RND*10)
 325 IF X<2 THEN GO TO 323
 330 IF SC>20*X THEN PRINT AT 2,
0; INK 2;"    ";AT 2,28; INK 2;"
    "
 335 IF SC>30*X THEN PRINT AT 2,
4; INK 2;"   ";AT 2,25; INK 2;"
   "
 340 IF SC>90*X THEN PRINT AT 2,
7; INK 2;"  ";AT 2,23; INK 2;"  "
 342 IF SC>120*X THEN PRINT AT 2
,9; INK 2;" ";AT 2,22; INK 2;" "
 343 IF SC>180*X THEN PRINT AT 2
,10; INK 2;"   ";AT 2,19; INK 2;
"   "
 344 IF SC>220*X THEN PRINT AT 2
,13; INK 2;"  ";AT 2,16; INK 2;"
   "
 345 IF SC>280*X THEN PRINT AT 2
,0;"          T O O     L A T E
    ": PAUSE 200: GO TO 3000
 348 PRINT AT R,C;" "
 349 REM moving
 350 IF INKEY$="9" THEN LET C=C-
1: LET SC=SC+(DI*2)
 355 IF INKEY$="1" THEN LET R=R+
1
 360 IF INKEY$="0" THEN LET C=C+
1: LET SC=SC+(DI*2)
 362 IF INKEY$="" THEN LET R=R-1
: LET SC=SC+(DI*2)
 365 IF R>20 THEN LET R=21: IF C
<0 THEN LET C=0: IF C>30 THEN LE
T C=31
 369 REM position scan
 370 IF SCREEN$ (R,C)="#" THEN G
O TO 7000
 371 IF SCREEN$ (R,C)="." THEN G
O TO 7100
 372 IF SCREEN$ (R,C)="↑" THEN G
O TO 7200
 373 IF SCREEN$ (R,C)="*" THEN G
O TO 7300
 374 IF SCREEN$ (R,C)="X" THEN G
O TO 7400
 375 IF SCREEN$ (R,C)="<" THEN G
O TO 1000
 376 IF SCREEN$ (R,C)=">" THEN G
O TO 1000
 377 PRINT AT 1,18; INVERSE 1;"T
IME GONE:";W
 379 IF R=2 THEN GO TO 2000
 380 REM rnd. plotter
 381 LET X=INT (RND*31)
 385 LET Z=INT (RND*21)
 390 IF Z<3 THEN GO TO 380
 392 PRINT AT Z,X;"X"
 395 IF R<2 THEN LET R=2
 500 NEXT W
1000 REM lives gone/hit somethin
g/time gone
1001 PRINT AT 10,9; FLASH 1;"YOU
'RE DEAD!!!"
1005 FOR A=0 TO -20 STEP -1: BEE
P .05,A: NEXT A
1010 CLS : PRINT AT 10,9;"AGAIN?
(Y OR N)"
1015 INPUT A$
1018 IF HI<SCS THEN LET HI=SCS
1020 IF A$="Y" OR A$="y" THEN LE
T SCS=0: CLS : GO TO 77
1030 STOP
1100 PRINT AT 10,6; FLASH 1;"YOU
 RAN OUT OF TIME"
1110 FOR A=0 TO 25: BEEP .01,A-1
0: BEEP .01,A+10: NEXT A
1115 GO TO 1010
2000 REM reached home
2001 LET SC=SC+200: PRINT AT 10,
6; BRIGHT 1;"YOU'VE DONE IT!!"
2002 FOR A=1 TO 3: FOR S=1 TO 20
2005 BORDER RND*6: PAPER RND*6
2010 BEEP .05,S: NEXT S: NEXT A
2015 CLS : LET SCS=SCS+SC
2018 IF HI <SCS THEN LET HI =SCS
2020 IF l$<>"a" THEN GO TO 2035
2025 LET DI=DI+1: IF DI<7 THEN G
O TO 2035
2030 PRINT AT 10,7; PAPER 7; INK
 4; FLASH 1;"YOU'RE THE GREATEST
!!": PAUSE 50: PRINT AT 15,6;"Yo
ur final score is:";SCS: LET SCS
=0: PAUSE 200: GO TO 1010
2035 PRINT AT 10,8; PAPER 7; FLA
SH 1;"Your score is:";SCS: PAUSE
 200
2045 LET SC=0
2050 PAPER 7: CLS : IF l$="a" TH
EN GO TO 90
2060 GO TO 80
3000 REM base disappeared
3001 PRINT AT 10,0; FLASH 1;"TOO
 SLOW, YOUR BASE  DISAPPEARED"
3010 FOR A=1 TO 30: BEEP .01,1+2
0: BEEP .01,A-30: NEXT A
3020 GO TO 1010
5040 REM space craft(N) U.D.G.s
5050 FOR L=0 TO 7
5053 DATA 24,60,126,255,126,60,2
4,0
5055 READ N: POKE USR "N"+L,N
5060 NEXT L
5000 RETURN
7000 LET SC=SC+100: LET L=L+1: B
EEP .01,30: GO TO 371
7100 LET SC=SC+50: LET L=L+1: BE
EP .01,20: GO TO 372
7200 LET SC=SC+150: LET L=L+1: B
EEP .01,10: GO TO 373
7300 LET SC=SC+50: LET L=L+1: BE
EP .01,40: GO TO 374
7400 LET L=L-1: BEEP .01,50: IF
L=0 THEN GO TO 1000
7401 GO TO 375
```

The ZX81 soft selection

Nick Pearce looks over the latest (and some of the greatest) software available for the ZX81

Two new cassettes feature in this article, together with re-reviews of three popular cassettes to give new ZX81 owners an insight into the software available for their machines. All the cassettes are for the ZX81 with 16K RAM.

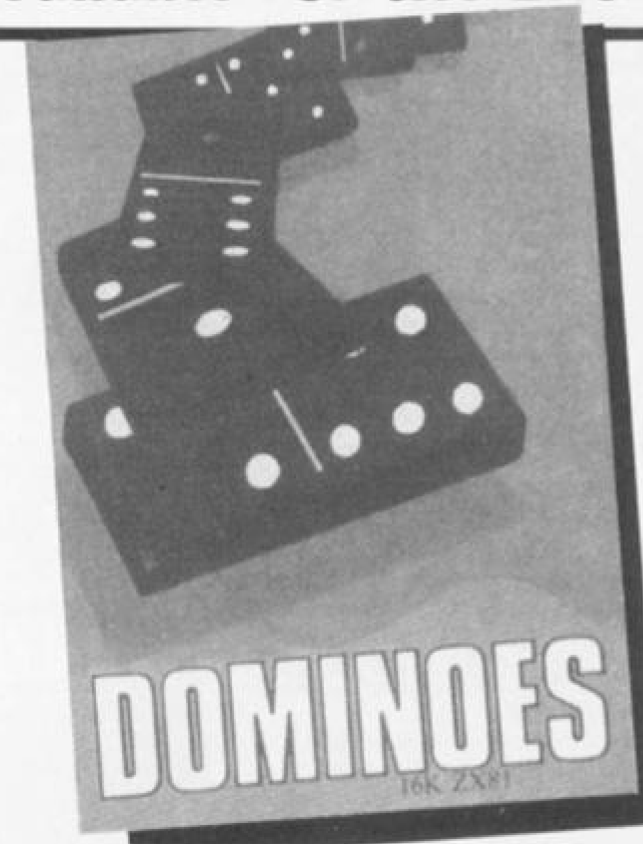
Alpharobe — Artic Computing

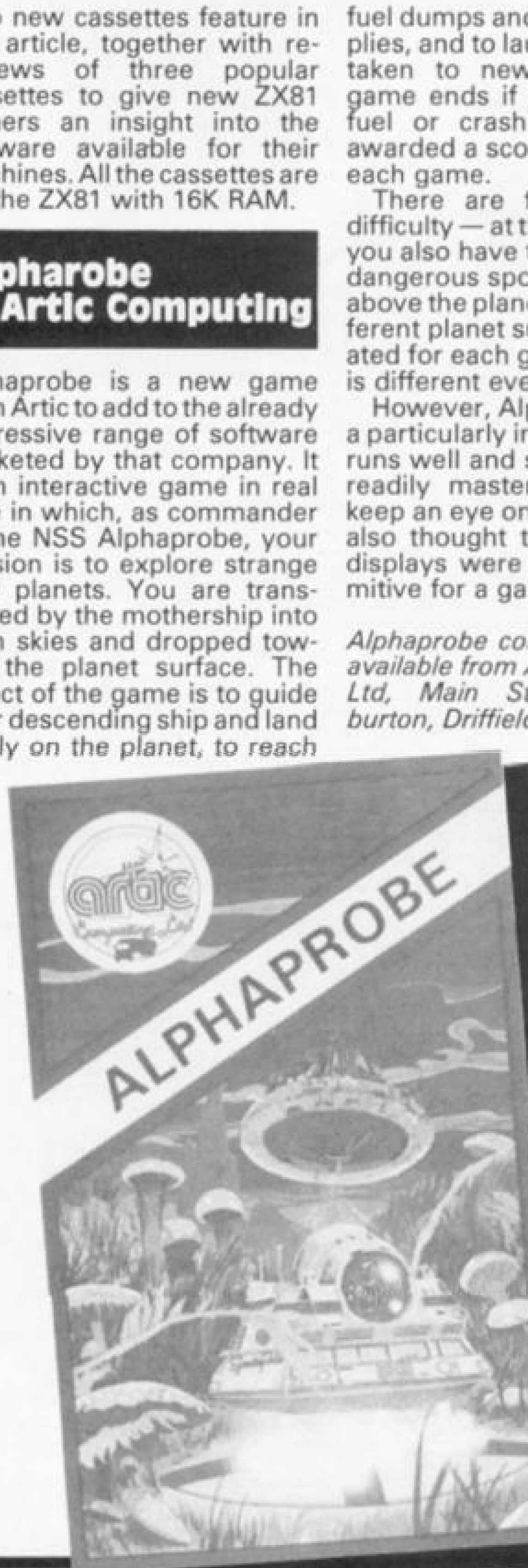
Alphaprobe is a new game from Artic to add to the already impressive range of software marketed by that company. It is an interactive game in real time in which, as commander of the NSS Alphaprobe, your mission is to explore strange new planets. You are transported by the mothership into alien skies and dropped toward the planet surface. The object of the game is to guide your descending ship and land safely on the planet, to reach fuel dumps and replenish supplies, and to launch pads to be taken to new planets. The game ends if you run out of fuel or crash and you are awarded a score at the end of each game.

There are five grades of difficulty — at the hardest level you also have to contend with dangerous spores in the skies above the planets and, as a different planet surface is generated for each game, the game is different every time.

However, Alphaprobe is not a particularly inspired game. It runs well and should be fairly readily mastered — but do keep an eye on the fuel level. I also thought that the screen displays were somewhat primitive for a game of this sort.

Alphaprobe costs £3.95 and is available from Artic Computing Ltd, Main Street, Brandesburton, Driffield, YO25 8RG.





Dominoes —Phipps Associates

Dominoes is the product of another well established company with a good track record, Phipps Associates, and a good simulation it is too.

Particularly impressive is the screen display. You play against the computer and your hand is displayed on screen throughout the game, together with the current scores, the 'end' dominoes and a record of the dominoes played.

The winner is the first player to score 72 points — scoring following the traditional 'divisible by three or five' rule. Watch out — the computer plays an intelligent game and is not easily beaten.

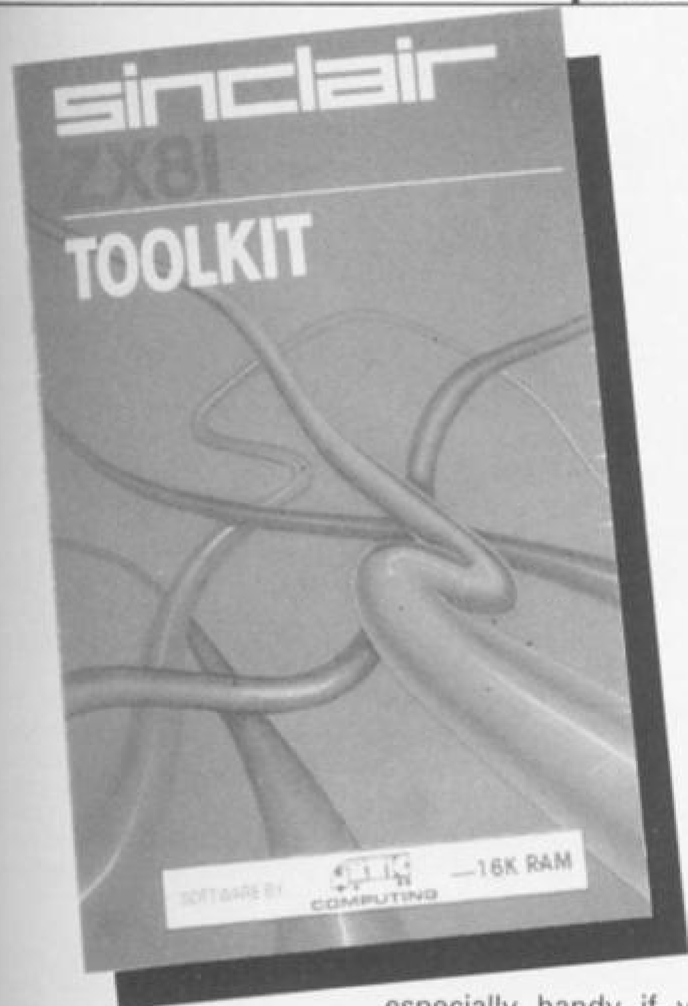
My only criticism is that the computer can take some time to respond and it can be frustrating having to wait for the necessary screen update. As it is a lengthy program, LOADing time is also protracted. However, Dominoes is an enjoyable game and proves a good opponent.

Dominoes costs £4.95 from Phipps Associates, 172 Kingston Road, Ewell, Surrey KT19 0SD.

Toolkit —Artic Computing

Toolkit provides a total of nine functions to ease the labour of program writing. After LOADing, it automatically lowers RAMTOP and sets itself up in the last 2¼ K of memory. This is a definite advantage over some other toolkits which require the user to reset RAMTOP before loading — something that can easily be forgotten.

Toolkit's facilities are obtained through USR calls.



Prompts are given on the screen and the program is fairly straightforward to use. Special error codes are given to identify the problem if anything goes wrong. The original review cassette contained closely typed instructions on one side of a sheet of A5 size paper. Artic have since improved the packaging and presentation and the instructions are now included on an attractive insert card.

In common with other utilities of this sort, Toolkit features a very useful renumber routine but Artic's is both quick and easy to use. The program also contains an impressive range of other programming aids, including facilities to delete groups of lines; to display the amount of memory available; to list the current variables of all string and numerical variables (except arrays and loop control variables) and find any string up to 255 characters in length and list every line in the program containing that string.

The replace command allows any string to be replaced by any other string — eg. PRINT can be replaced by LPRINT throughout a program. By saving the current program below RAMTOP, another program can be loaded allowing two programs to be joined.

Another useful function is REMKILL which removes all REM statements. This is especially handy if you are running short of memory or want to speed up LOADing or SAVEing.

This must be one of the better toolkits around for the ZX81. It is easy to use, executes commands quickly and accurately, and all its functions are likely to have some value for both the novice and for the more experienced BASIC programmer. Toolkit takes up only 2K of memory and is quickly loaded which is pretty impressive considering the range of functions available: a highly recommended cassette.

Toolkit costs £5.95 and is available from Artic Computing Ltd, Main Street, Brandesburton, Driffield YO25 8RL.

Vufile — Psion

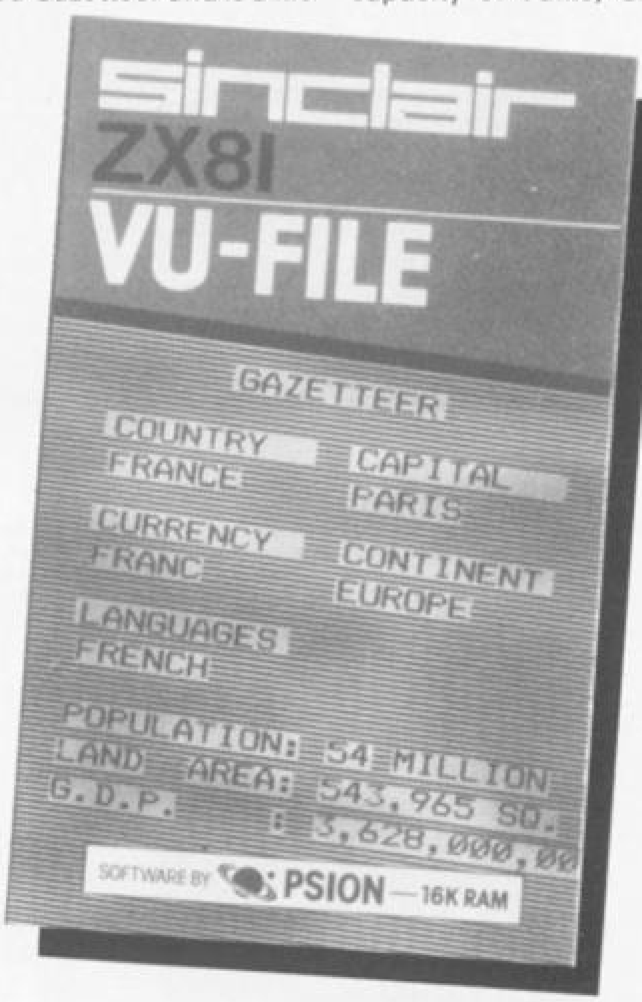
Another popular program for the serious user. Vufile is a general-purpose filing program produced by Psion and included in the Sinclair software range. It is the sort of program you could use to catalogue your coin or stamp collection, keep a name and address list of friends, or for business, maintain a record for your club or society, or even keep a file record of all your ZX81 software!

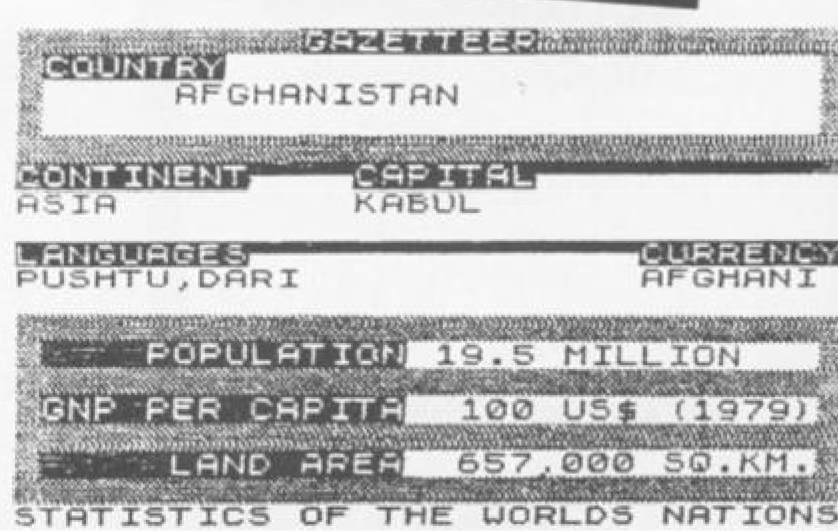
The program is logically displayed and easy to use. To begin you lay out the record using headings, titles and graphics symbols. Anything entered during this record layout mode will be shown on each record on the file. Data is entered into the file from the main command mode. As well as ENTER, the other main commands are ALTER, INFORM, FORWARD, BACK, RESET, ORDER, PRINT, COPY, SELECT, QUIT, LIST, and DELETE. Together they provide a comprehensive file handling capability and can be implemented simply by keying in just the first letter of each command.

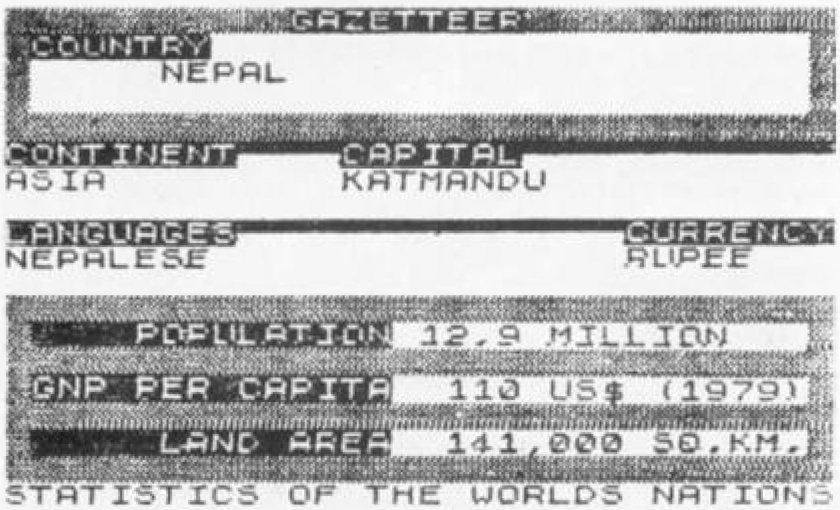
On the B side of the cassette is an example of an application for Vufile. The program is called Gazetteer and is a file of records for every country in the world, giving its name, its capital city, the main language and the like. I made use of Gazetteer to get a feel for the manipulative and interrogative power of the main program.

On the command LIST, each successive record in the field is displayed for about one and a half seconds. So I was able to select and view any country in the file almost immediately. By using the FORWARD and BACKWARD commands you can step through the file. RESET sends you to the first record, ORDER defines the particular sequence required and INFORM gives the file status information.

As an indication of the capacity of Vufile, Gazetteer







holds records on 152 countries and uses 96% of the space available.

There's only one complaint and that's not about the quality of the program which is very high indeed, but the inconvenience of loading the files from cassette. Few people would be prepared to wait for five minutes or more to load a file just to obtain the address of a friend or colleague. The ZX81 really needs a disc operating system to enable it to be effective for this sort of work. A version of the program is available for the Spectrum and with the Microdrive forms a useful and powerful file handling system.

Nevertheless, Vufile is a very good program and does all that it claims to. It certainly gave me a better understanding of how computers can be used for storing data and the power a computer system can offer.

Vufile costs £7.95 and is produced by Psion, available from Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.



Nowotnik Puzzle —Phipps Associates

Finally, a program that continues to tantalise since its release in 1982. The Nowotnik Puzzle is an original concept in computer games and requires the warped thinking of the Rubik Cube devotee to solve it.

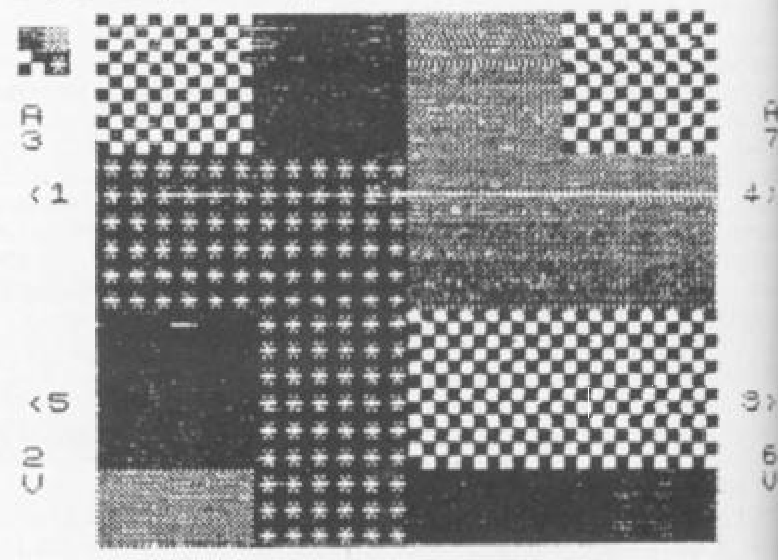
Whilst only two dimensional it is nevertheless frustratingly difficult to solve. At the beginning, and when (and if!) completed, the puzzle is in the form of four large squares. These squares are shuffled by the computer using a random selection of eight possible movements and the idea of the game is to use these eight movements to get the four squares back to their original layout. At the simplest level each of the four large squares is broken up into four by the shuffle giving sixteen smaller squares; at the hardest level the four squares are each divided into 144 pieces, giving a total of 576 elements altogether!

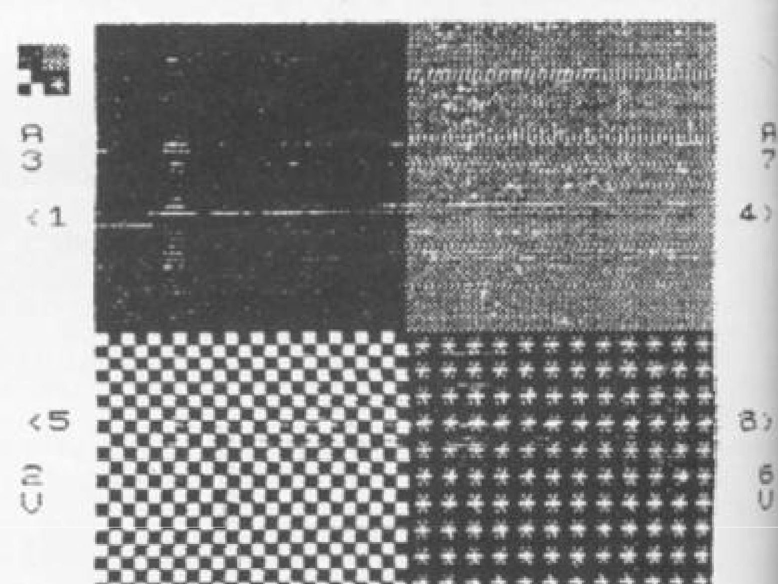
If you complete the puzzle you are told the number of moves taken. There is also a game save facility so that a partly completed puzzle can be continued (and hopefully finished) sometime later. I would have liked an option to reduce the number of shuffles so that a logical method of solution could be developed by trial and error during the first few attempts: the sight of a well shuffled puzzle on the first attempt is itself rather daunting.

Conceptually, the puzzle is similar to the dratted Cube. It is relatively easy to complete one square (or face), but it is solving the whole puzzle without ruining what you have already accomplished that is so infuriatingly difficult.

But, also like the Cube, the Nowotnik puzzle is an addictive game and with two other games included in the price (an interactive game called Demolition and a tenpin bowling simulation) this cassette is a very good buy.

The Nowotnik Puzzle costs £5.00 and is available from Phipps Associates, 172 Kingston Road, Ewell, Surrey KT19 0SD.



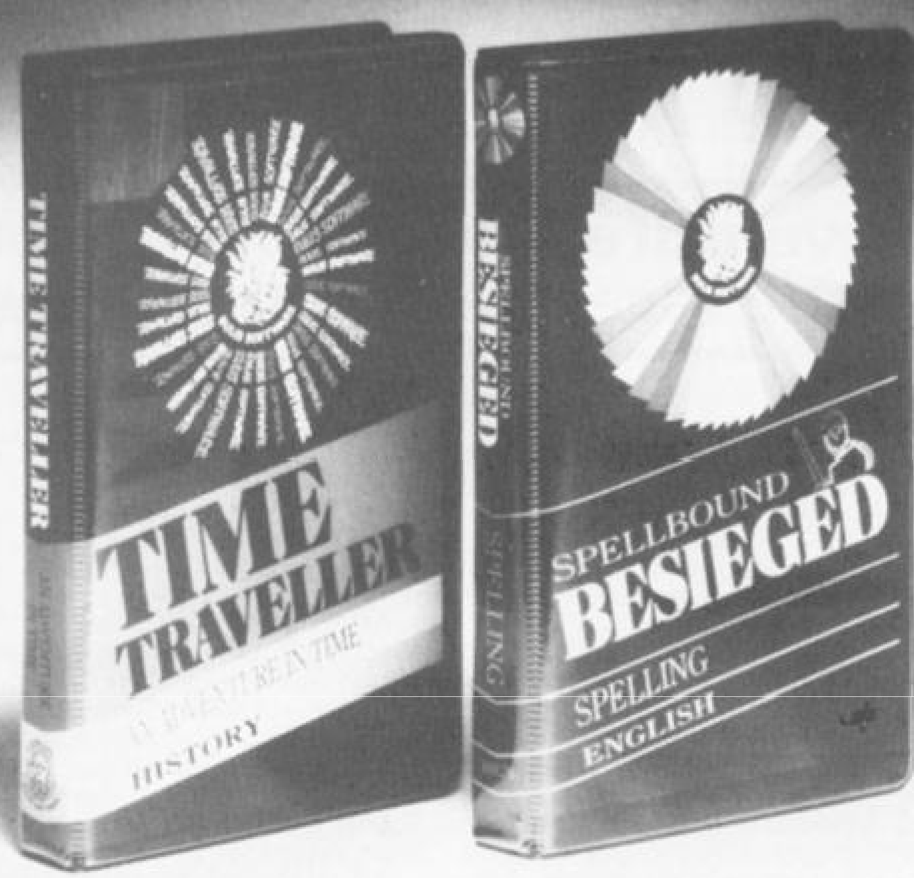


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Two exciting games from Sulis that turn the clock back years



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Time Traveller 094665834X £9.95 inc VAT

An adventure in time that tests your overall knowledge of British history.

The program contains five exciting chase games in one: a Bronze Age forest with wolves, a Roman fort with legionaries, a Norman cathedral with priests and prelates, a 16th-century ducal palace and a Victorian sewer with rats and germs.

At each stage of the game you have to get your historical facts right before you can slip through the time warp into the next Age.

Besieged 0946658080 £9.95 inc VAT

An utterly compulsive word game for anyone who thinks they know which word means what and how it is spelt.

The scene is set in the age of the Crusades, with gallant knights attempting to relieve a beleaguered city from the grasp of infidels.

Every word you spell correctly helps one of your knights in their struggle. Spell a word wrong and the infidels will have the advantage.

Both of these educational games are available for use on the ZX Spectrum and can be obtained from W H Smith, larger branches of Boots, or any good bookshop or computer store.

Sulis Software

Sulis Software is marketed by John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD, England

ZXC meets Software

Ray Elder ventures into the West country to meet the faces behind the software.

Taunton, main town of Somerset is steeped in tradition and yet alive with today's technology. In a pleasant olde worlde house just off the town centre, I was welcomed by Robert White, the founder and sole proprietor of Durell Software.

In the top room, where oak beams and computers seemed at ease with each other, Robert, a lively, cheerful and interesting man who looks younger than his 30 years, told me of the history of his small but rapidly expanding company.

Having already qualified as an art teacher, Robert then did a degree in quantity surveying. After a year, however, he found the course boring and decided to specialise in using computers graduating with an Honours First. He then started working for Oxford Health Authority as a CAD (Computer Aided Design) specialist for whom he still works as a consultant.

Working on a large computer called the Building Design System Robert models buildings in 3D, specialising in graphics and measurements — a facet of computing which is often forgotten in the glut of home computing hysteria. One of his designs is reproduced here with permission from Applied Research of Cambridge.

Robert also showed and explained the General Drafting System which stores data for things like maps, and can display them at different sizes and scales including or omitting details as appropriate.

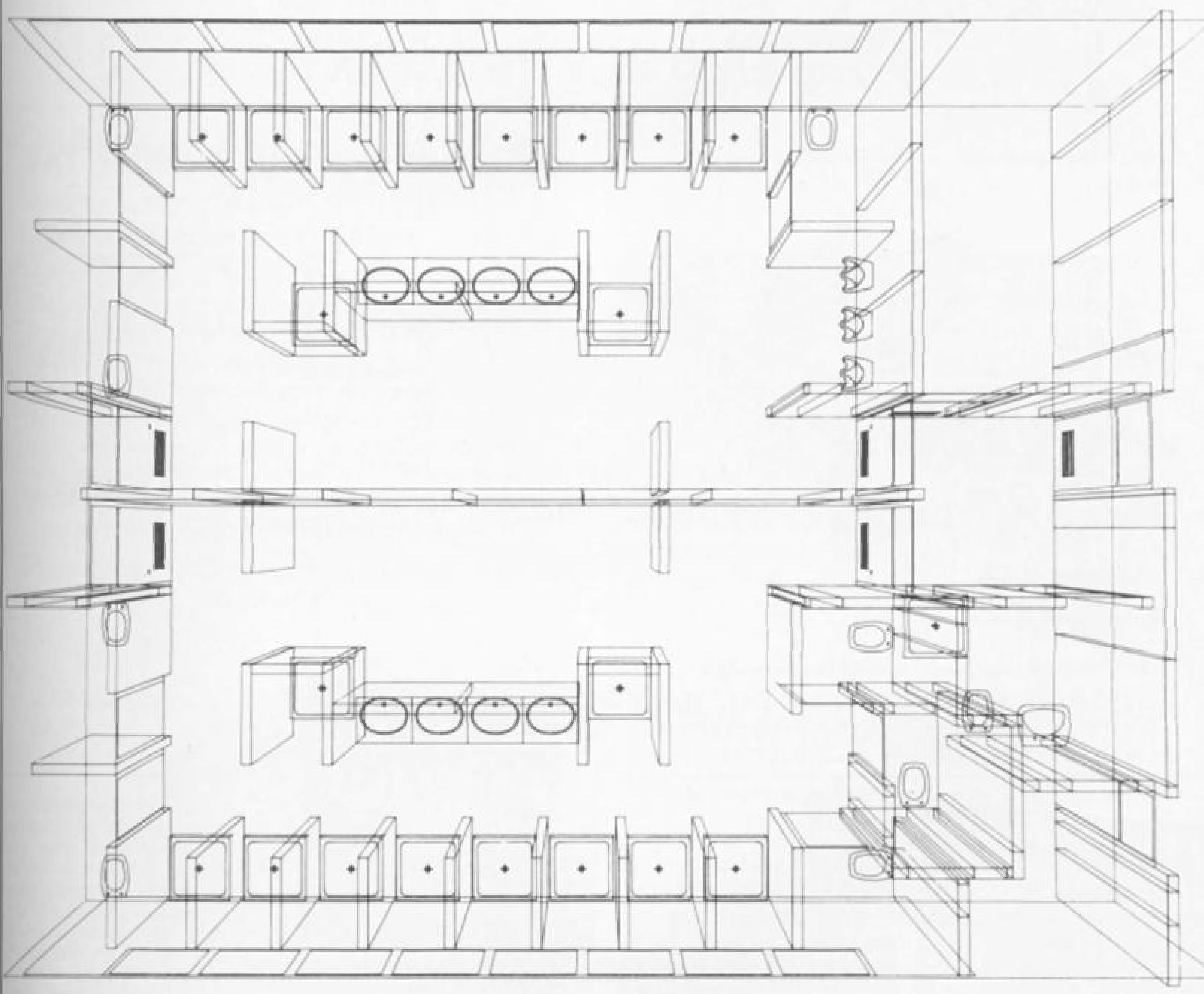
After three extremely interesting years with Oxford Health Authority, Robert decided to leave in order to write programs of his own rather than implement architect's designs. He set up shop in Taunton in February with an aim of producing software for the Oric which had just been released. This he did, taking two months to write an assembler and dissassembler in BASIC.

His next program, Lu
Lander/Asteroids, was ag
written in BASIC with the st
intention that it SHOULD
listed and it was full of REMS
explain its operation so that p
grammers could learn from it
It was at this stage t
Robert began to consider adv
tising in computer magazi
and realised that to make it c
effective he needed to invo
other programmers in order
expand his range of tapes.
advertisement in the local pa
produced four quality Mach
Code programmers, one
whom was Mike Richardson,
unassuming 26 tear old, M
writes the Spectrum softw



Mike Richardson and Robert White hard at work on their next success!

Durell



Plotted graphics of components assembled in 3D, from the 3D visualise Module.

Diagram courtesy of Applied Research of Cambridge Ltd.

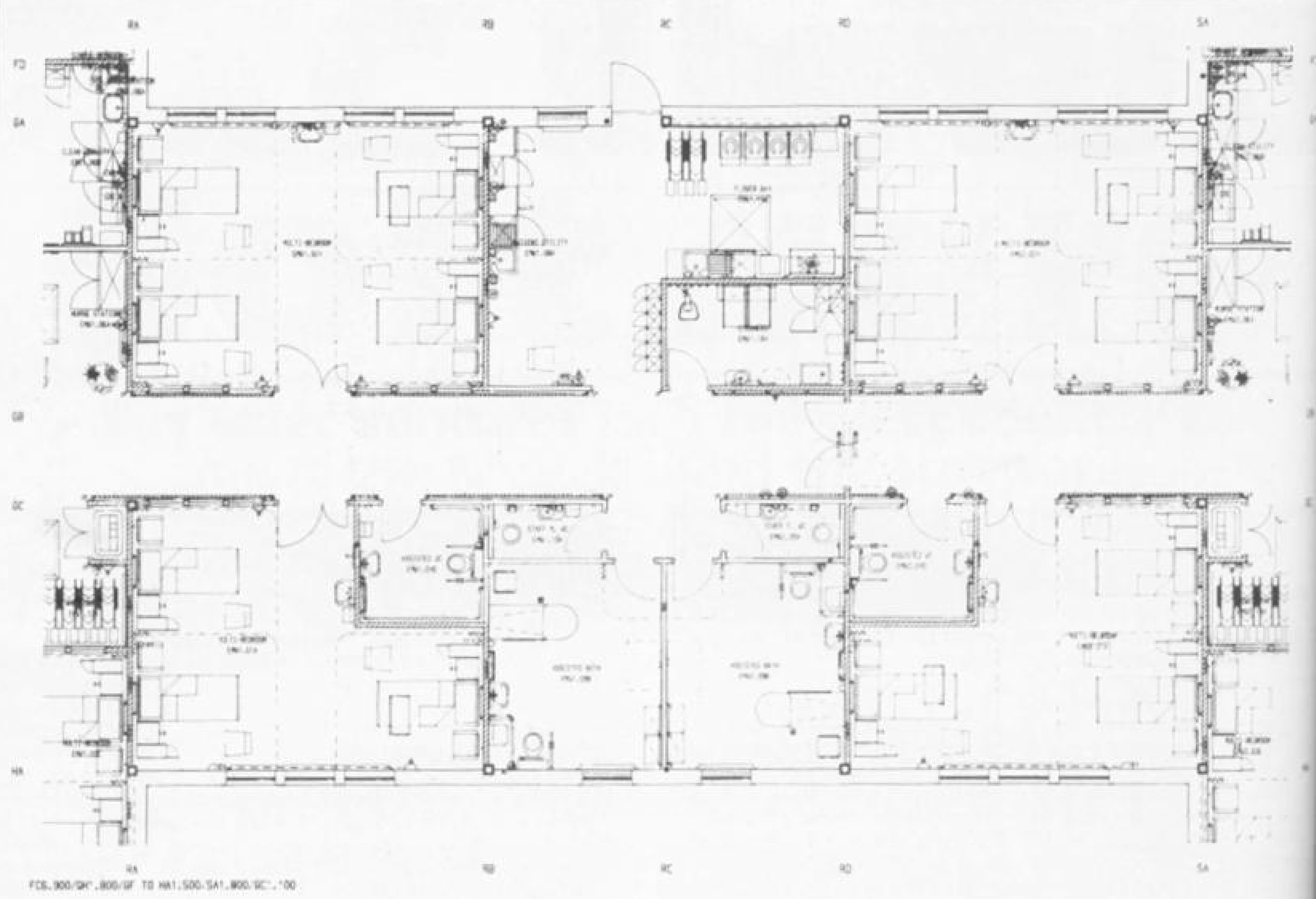
and is regarded as the "resident genius" by Robert.

Robert supplied all his programmers with suitable machinery and briefed them with his current game idea — an aircraft arcade game which he called Harrier Attack. This became his first major tape for the Oric, Spectrum, Commodore and Atari and was a great success, reaching number seven in the software charts. Meanwhile, Mike had been developing an idea of his own. Mike, Robert himself, and all his other programmers all work on a royalty basis as he is very much against the nine to five working system.

Although Robert was dubious about Mike's idea of a graphics adventure game set in the jungle, Mike produced Jungle Troubles and Robert happily confirms that it has been another success for them.

Scuba Dive is their latest game. Robert is very enthusiastic about it while Mike is quietly embarassed. From the brief preview I had of it, being taken through sections many players won't see for a long time, I was impressed with the quality of the graphics and animation — it must be another winner!

In general, Robert is aiming to produce multi-machine games, moving away from the violent type of program and towards the area of family, cartoon style game. The competition, especially from the companies who indulge in expensive advertising campaigns, almost dissuaded Robert from producing Spectrum tapes and almost lost us some very high quality programs.

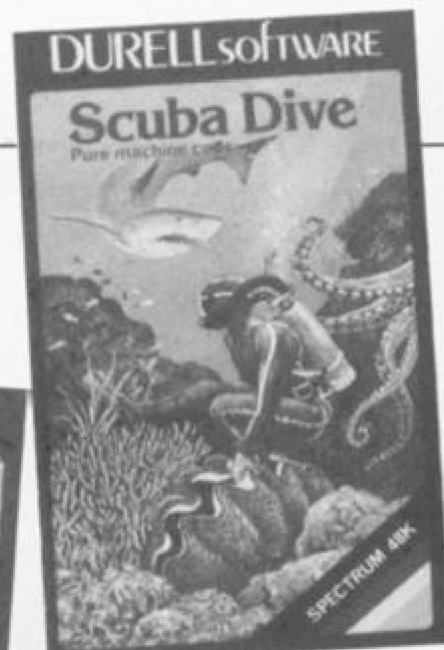


Plotted hospital ward layout, from the drawing module.

Diagram courtesy of Applied Research of Cambridge Ltd.







Put to the test

Harrier Attack: Take off, fly over sea and land defences to attack enemy installations on a nearby island and return. You have rockets and bombs plus complete control over speed and height. *Comment: A good game, well worth having and has an element of that elusive, addictive quality.*

Jungle Troubles: Jump on th stepping stones to cross t crocodile infested river w your axe. Climb a ladder a chop down the trees (th monkeys don't help here!) th climb to the final level and sw across the fire pit to reach t last hurdle before reachi home. *Comment: not eas Great cartoon type graphics.*

Scuba Drive: Swim dow through a selection of fi fiends, locate a cave entran and explore the caverns coll ting pearls and treasu However, some are dead end monsters abound, the clams c trap you and your oxygen is ru ning out. Also your boat is mo ing so it may not be where y left it when you want it! *Co ment: As good as anyth around. Superb graphics, e cellent animation and very mu a 'just one more go' gam*

Thanks to Paul Shelley, 1 *for his unbiased comments.*

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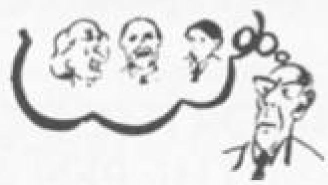
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Squares

Shoot the cube with David Parkinson of Wolverhampton.



Would you want to be eaten by a large cube that is rolling towards your planet eating everything in its path? Luckily you are given some ammunition with which to fight back!

To move press keys 1 to go left and 2 to go right. When you fire a missile by pressing key 5 the enemy will stop. Can you save the peaceful citizens of the planet Nero or will this be the end of civilisation as we know it? Their fate is in your hands. . . . .



```
  1 LET sc=0: GO SUB 300: LET p=.1: PAPER 0: INK 7
  2 LET shs=6: LET p=p/1.3: IF p<0.0007 THEN  LET p=0.0007
  3 PRINT  AT 0,0;"QQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQQ"
  4 PRINT  AT 1,0; CHR$ 137; CHR$ 140; CHR$ 134: PLOT  OVER 1;10,162: PLOT  OVE
R 1;14,162
  5 FOR j=1 TO 100
  6 PLOT  INK  RND *8; RND *255, RND *175
  7 NEXT j
  8 FOR q=0 TO 2: LET t=( RND *210)+20: LET l=( RND *130)+20: FOR h=1 TO ( RND
*4)+3: CIRCLE t,l,h: NEXT h: NEXT q
  9 FOR r=2 TO 15: BEEP .3,r: NEXT r: PLOT 0,0: DRAW 255,0,-1.2
 10 BORDER 0
 20 LET i=22593
 30 LET n=1
 40 LET x=22528+703-15
 45 PAUSE 50
 50 POKE x,56: POKE x-1,0: POKE x+1,0
 51 PRINT  INVERSE 1; AT 0,0;"SCORE=";sc
 55 IF n=703 THEN  BEEP 3,23: POKE 23609,0: PRINT  AT 21,10;"YUM YUM!"; AT 20,0
;"you're dead!AAAAA"; AT 5,10;"Score:";sc; AT 10,0;"FINAL SCORE:"; AT 12,0;"Us(a
lien utd.),1 square block"; AT 14,0;"Them(the twit with the missiles:"; AT 15,29
;sc/10: STOP
 60 POKE i+n,56: POKE i+n-1,0: BEEP p,20
 62 IF  RND >.9 THEN  GO SUB 500
 65 IF  IN 63486=255 THEN  LET n=n+1: POKE 23618,50: POKE 23620,1
 70 IF  IN 63486=254 THEN  LET x=x-1: LET n=n+1: POKE 23618,50: POKE 23620,1
 80 IF  IN 63486=253 THEN  LET x=x+1: LET n=n+1: POKE 23618,50: POKE 23620,1
 90 IF  IN 63486=239 THEN  LET shs=shs-1: POKE 23618,150: POKE 23620,1
100 LET n=n+1: POKE 23618,50: POKE 23620,1
150 IF shs <= 0 THEN  POKE 23618,100: POKE 23620,1
```

STOP! Before typing in this program, please see the Editor's note in the Welcome section.

```
151 FOR k=0 TO 31
160 IF  ATTR (21,k)=56 THEN  GO TO 180
170 NEXT k
175 POKE 23618,100: POKE 23620,1
180 FOR f=19 TO 0 STEP -1
190 PRINT  AT f,k;"A"; AT f+1,k;" "
192 BEEP .02,f
195 IF  ATTR (f-1,k)=56 THEN  LET sc=sc+shs*10: LET shs=5: PRINT  AT f-1,k;" ";
AT f,k;" ": PAUSE 70: LET n=1: BEEP 2,-10: POKE 23618,50: POKE 23620,1
197 NEXT f
200 POKE 23618,100: POKE 23620,1
300 FOR g=0 TO 7
305 READ s
310 POKE  USR "A"+g,s
320 NEXT g
330 DATA 24,24,24,24,24,126,90,129
335 RESTORE 400
340 FOR g=0 TO 7: READ s
350 POKE  USR "Q"+g,s: NEXT g
360 DATA 34,62,28,28,8,8,62,42
400 DATA 34,62,28,28,8,8,62,42
410 RETURN
500 LET k= RND *255: PLOT k,170: DRAW 0,-160
505 FOR m=0 TO 30: NEXT m: DRAW  OVER 1;0,159
510 IF  ATTR (21, INT (k/8))=56 THEN  GO TO 800
515 RETURN
800 PRINT  AT 10,5;"SCORE:";sc; AT 15,0;"FINAL SCORE:"; AT 17,0;"us(alien utd.
,1 square block"; AT 19,0;"them";sc/10
```

New books and software are cropping up everywhere. Here's the pick of the bunch.



MASTERING THE ZX SPECTRUM

by **Lawrie Moore.**

This book is about how to enjoy your Spectrum through learning programming and handling the machine: it dispels the mental block which sometimes occurs for beginners, that of grasping and understanding the building of a program.

085312 700 X 180pp £5.95
Published by Ellis Horwood Ltd., Chichester and marketed by John Wiley & Sons Ltd.



WORDPOWER
Vocabulary and Spelling

by **Sulis Software**

WORDPOWER is a powerful package containing more than 1200 words, including opposites, synonyms, nouns/adjectives, collectives and similes. A choice of two games, plus a key-in option and different levels of difficulty make up a compulsive package — and you'll soon find you're packing a new punch with words you've never known how to use before.

Cassette
0946658005 Cassette £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.



TENSE FRENCH
Know Your Verbs

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TENSE FRENCH teaches you how to get those basic French verbs right. The little beasts are translated, listed and tested, so that whether you've a gift for languages or not, they won't bother you again.
Working in the tense of your choice, *you* decide whether you want to be tested, when and what on.

Cassette
0946658560 Cassette £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.



SPELLBOUND: BESIEGED
Spelling

by **Sulis Software**

Can you get your crusading knights across the ravine to relieve the beleaguered city — or will the infidels get there first? Every word spelt right in this game is a safe crossing for one of your knights. Spell a word wrong, and the infidels will have an advantage over you.

Cassette
0946658080 Cassette £9.95
Published by Sulis Software Ltd. and marketed by John Wiley & Sons Ltd.



DYNAMIC GAMES FOR THE ZX SPECTRUM

by **Tim Hartnell**

This book provides 20 dynamic games of lasting interest. They range from board games like *Chess* and *Pirandello,* to arcade action in *Jogger* and *Deathrace 2000,* and include a major adventure game, *Revenge of Castle Dread.*
A detailed introduction is provided for every game.

186pp
0946195137 186pp £5.95
Published by Sinclair Browne Ltd. and marketed by John Wiley & Sons Ltd.

THE ZX CLOAK AND DAGGER BOOK
Codes and Cryptography on the ZX81 and Spectrum

by **Gareth Greenwood**

Cryptography is an absorbing subject which has had a steady amateur following for many years, particularly amongst young, technically minded schoolboys. The advent of cheap, personal computers now makes it possible for the interested person to experiment directly with codes and ciphers using the machine as an encryption device. This book is oriented around the use of a computer for practical experi mentation.
Contents include: Secret Communications, ZX81 As a Cipher Machine, Simple Cipher Systems, Solving Simple Substitution Ciphers, Less Simple Transpositions, Breaking Transposition Codes, Tougher Ciphers, Cipher Security,

Spring'84 approx. 150pp
0905104 498 approx. £6.95
Published by Sigma Technical Press and marketed by John Wiley & Sons Ltd.



THE SINCLAIR SPECTRUM IN FOCUS

by **Mark Harrison**

This book supplements the Sinclair operating manual providing answers to some of the questions posed but left unanswered. It is designed for readers of all ages with either no previous computer experience or those requiring more assistance.

198pp
0905104 285 198pp £6.25
Published by Sigma Technical Press, and marketed by John Wiley & Sons Ltd.

SINCLAIR SPECTRUM AND ZX81 ADD-ONS
Microcomputer Hardware Projects

by **Natasha Graham** and **Michael Roberts**

Contains all you need as an introduction to microcomputer interfacing, hardware design and machine code programming. The Sinclair computers are well known for running simple BASIC programs and for game playing but how many people have used them for hardware projects? — one of the most exciting areas — actually getting a micro to do something useful. This book takes you step-by-step from nervously switching on the soldering iron, through to challenging projects such as controlling lights, switches and simple video games. Through these projects, machine code programs are written which control the external hardware.

Spring'84 approx. 150pp
0905104 641 approx. £6.95
Published by Sigma Technical Press, and marketed by John Wiley & Sons Ltd.

John Wiley are major publishers and distributors of books and software for the computing world. As well as Wiley professional reference books and software an extensive range of titles for the student and hobbyist is available by other leading publishers including Ellis Horwood, Mosaic, NCC, Sigma Technical Press, Sinclair Browne and Sulis Software.

COMPUTER BOOK MONTH

During March 1984 a wide range of books and software will be on display at leading bookshops and computer stores. For a checklist of titles please write to Annabella Duckit, John Wiley & Sons Ltd., FREEPOST, Baffins Lane, CHICHESTER, West Sussex PO19 1YP

The Alphacom 32 Printer

Ray Elder takes a look at another way of getting into print at a reasonable price.

The first attempt to improve the listings in *ZX COMPUTING* was an investigation into an alternative printer. The Alphacom 32 is the American version of the Sinclair printer and is marketed in Britain by Dean Electronics. Originally priced at £99.95, it has now been reduced to £59.95 due to an exclusive distribution agreement.

In size it is nearly twice as deep and slightly longer than the ZX printer and looks an altogether sturdier machine (actual measurments are 19.4cm x 14.4cm x 7.5cm). The printer comes complete with connector, a roll of paper, instruction book and power supply unit, the PSU being used at the same time as the Sinclair PSU. It also uses all the Sinclair commands; LLIST, LPRINT and COPY.

Having unpacked the unit from its attractive box and read the instructions, the next thing to do was connect it to the Spectrum (it is compatible with both ZX81 and Spectrum). The Alphacorn connector is larger than the usual connector, having a hump which is flush with the top of the Spectrum when fitted, and a row of spring clips along the underside. These clips do not seem to have any practical use (probably an earthing connection on the American Timex machine) but you have to fit the connector carefully in order not to bend or break them. The connector has a good, tight fit and presented no problems.

Next step was to fit the paper to the machine. Thermal paper is used as on the ZX printer, but this is white unlike Sinclair's silver paper, and it produces a blue coloured print. Feeding the paper into the machine only took a few seconds and the roll then sits in a tray. It is not held on spindles like the Sinclair roll and this probably helps to keep the feed straight.

Two switches are provided on the printer, an OFF and an ON/ADVANCE switch — pressing both puts the printer into self test mode where it continually prints alternate lines of 1s and 8s.

OK. so what's it like in operation?

The first thing I noticed was how quiet it was. Being used to the ZX's strangulated croak, I was worried that it wasn't working! But, as the print appeared the other immediately impressive feature became obvious — the speed of printing is much faster, two lines a second in fact.

For technical buffs I'll give the specifications:

Graphics at 80 dpi (256 x n)
Vertical line spacing; 6 1pi
Horizontal spacing: 10 cpi

For non technical buffs, this means that the print is slightly thinner and slightly taller!

The print is easy to read with the naked eye, looks very professional and the paper is easy to handle. It does not tend to take a copy of your fingerprints every time you touch it! The paper is also much cheaper tha the ZX printer paper, at £1.0 per 25 metre roll.

The main disadvantage of th machine is the great number o extra leads involved by using seperate PSU. If your syste is permanently set up then the can be tucked away neatly an forgotten, but if you are using mobile system then they ad significantly to the spaghe tiness of the situation.

Having produced twenty or s printouts on this machine, I sen them to our reproductio department for them to con gratulate me on discovering






```
1000>FOR N=0 TO 7: READ A: POKE
USR "A"+N,A: NEXT N: DATA 0,24,2
4,255,189,60,36,102
1001 FOR N=0 TO 7: READ A: POKE
USR "F"+N,A: NEXT N: DATA 0,56,5
6,48,60,48,104,76
1002 FOR N=0 TO 7: READ A: POKE
USR "E"+N,A: NEXT N: DATA 0,28,2
8,12,60,12,22,50
1003 FOR n=0 TO 7: READ A: POKE
USR "L"+N,A: NEXT N: DATA 255,12
9,129,129,129,129,255,255
1010 FOR N=0 TO 7: READ A: POKE
USR "B"+N,A: NEXT N: DATA 195,66
,126,90,126,126,36,66
1020 FOR N=0 TO 7: READ A: POKE
USR "C"+N,A: NEXT N: DATA 255,25
5,24,24,24,24,24,255
1030 FOR N=0 TO 7: READ A: POKE
USR "D"+N,A: NEXT N: DATA 195,19
5,195,255,255,195,195,195
1031 FOR N=0 TO 7: READ A: POKE
USR "G"+N,A: NEXT N: DATA 12,16,
40,68,66,1,0,0
1032 FOR N=0 TO 7: READ A: POKE
USR "H"+N,A: NEXT N: DATA 0,0,1,
66,68,40,16,12
1033 FOR N=0 TO 7: READ A: POKE
USR "I"+N,A: NEXT N: DATA 96,3,2
0,34,66,128,0,0
1034 FOR N=0 TO 7: READ A: POKE
USR "J"+N,A: NEXT N: DATA 0,0,12
8,66,34,20,8,96
1035 FOR N=0 TO 7: READ A: POKE
USR "K"+N,A: NEXT N: DATA 0,129,
129,129,193,243,255,255
```

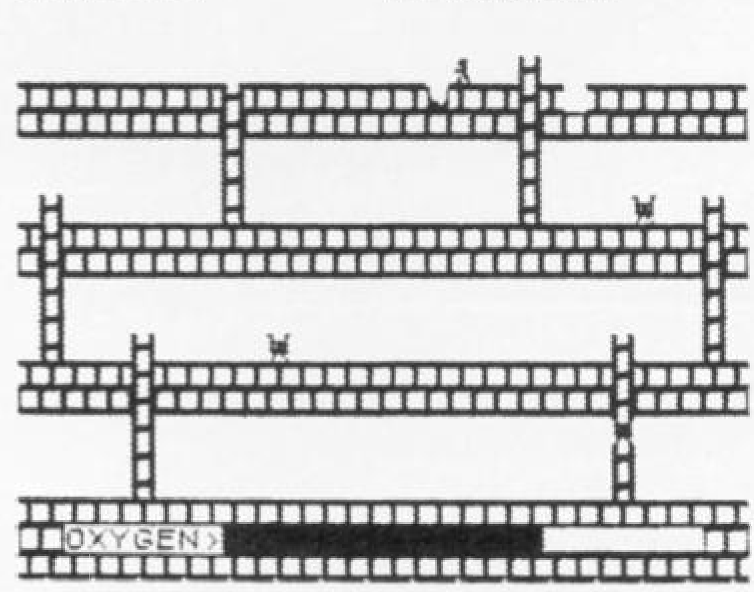
Fig. 1.

better listing print. My smug self-satisfaction was quickly destroyed as the print would not copy well enough to use in magazine! The project therefore, is still on.

However, if you are looking for a very good alternative to the ZX printer, I can wholeheartedly recommend this machine. At the new reduced price it represents very good value for money.

Fig. 1. shows a few lines from this printer as an example of its output. Please remember that the reprodcution is not very successful and the quality is actually better than is shown.

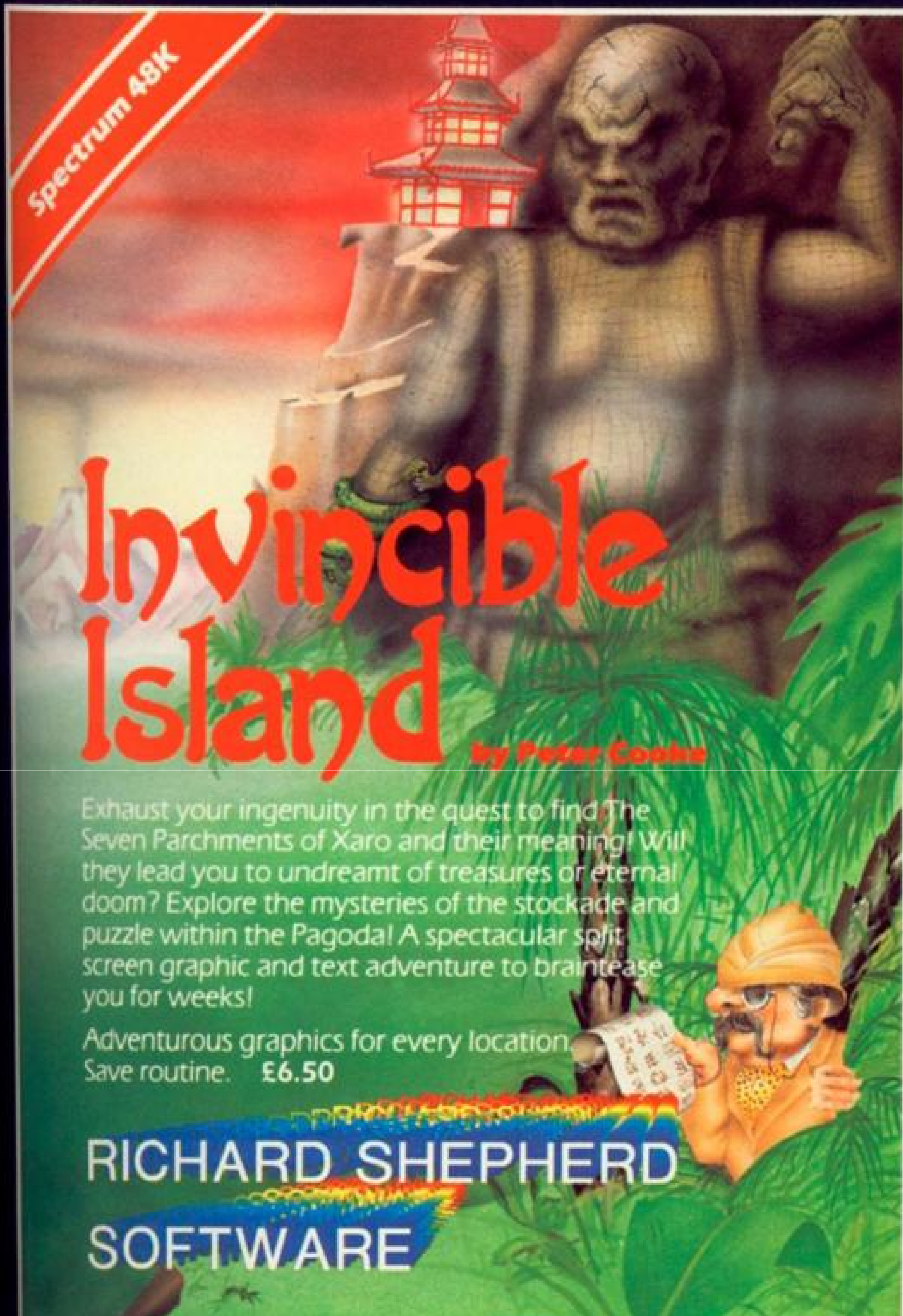
Finally, Dean Electronics can be contacted at Glendale Park, Fernbank Road, Ascot, Berkshire, SL5 8JB. Meanwhile, they have kindly dontaed an Alphacom 32 as this month's super competition prize.

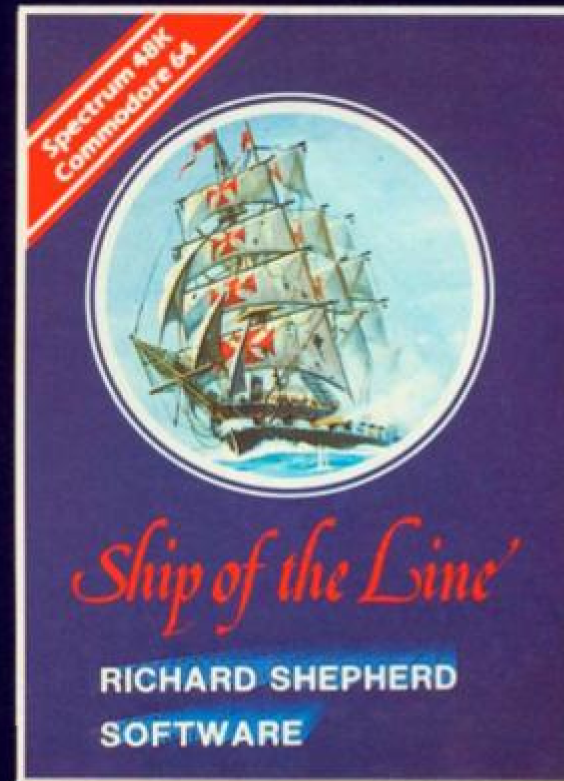


A sample screen display on the Alphacom 32.

"ADVENTURES INTO IMAGINATION"

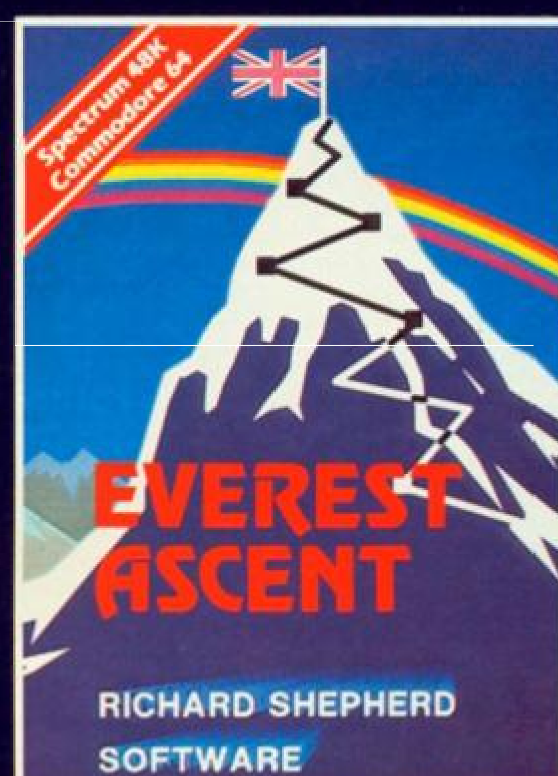
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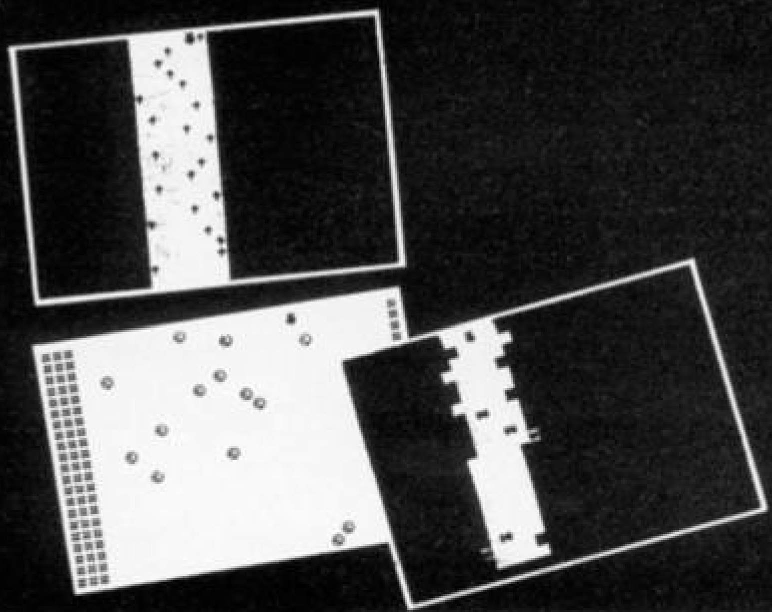
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SOFTWARE

ELM HOUSE, 23-25 ELMSHOTT LANE, CIPPENHAM, SLOUGH, BERKSHIRE.

Tunnel run



Scramble through the space maze in this program from David Link of Liverpool.

Loosely based on one of the more popular arcade games, Tunnel run has you exploring a space maze in your star ship. There are four stages to the game, in which you must pass through the missile tunnel, the asteroid field, the winding tunnel and finally, you have to land your craft on the landing pad.

The program works mainly through the fact that POKEing a number between one and 255 into SCRCT at 23692 will make the screen scroll without asking the dreaded question 'scroll?'.

The terror of the tunnel

The movement keys used throughout the program are the '5' key to move left and the '8' key to move to the right. In the second stage of the game, you use the '0' key to blast at the blue spacecraft that try to hinder you. But be warned, each time you fire at the ships you will lose 20 points; however, if you manage a hit then you gain 100 points.

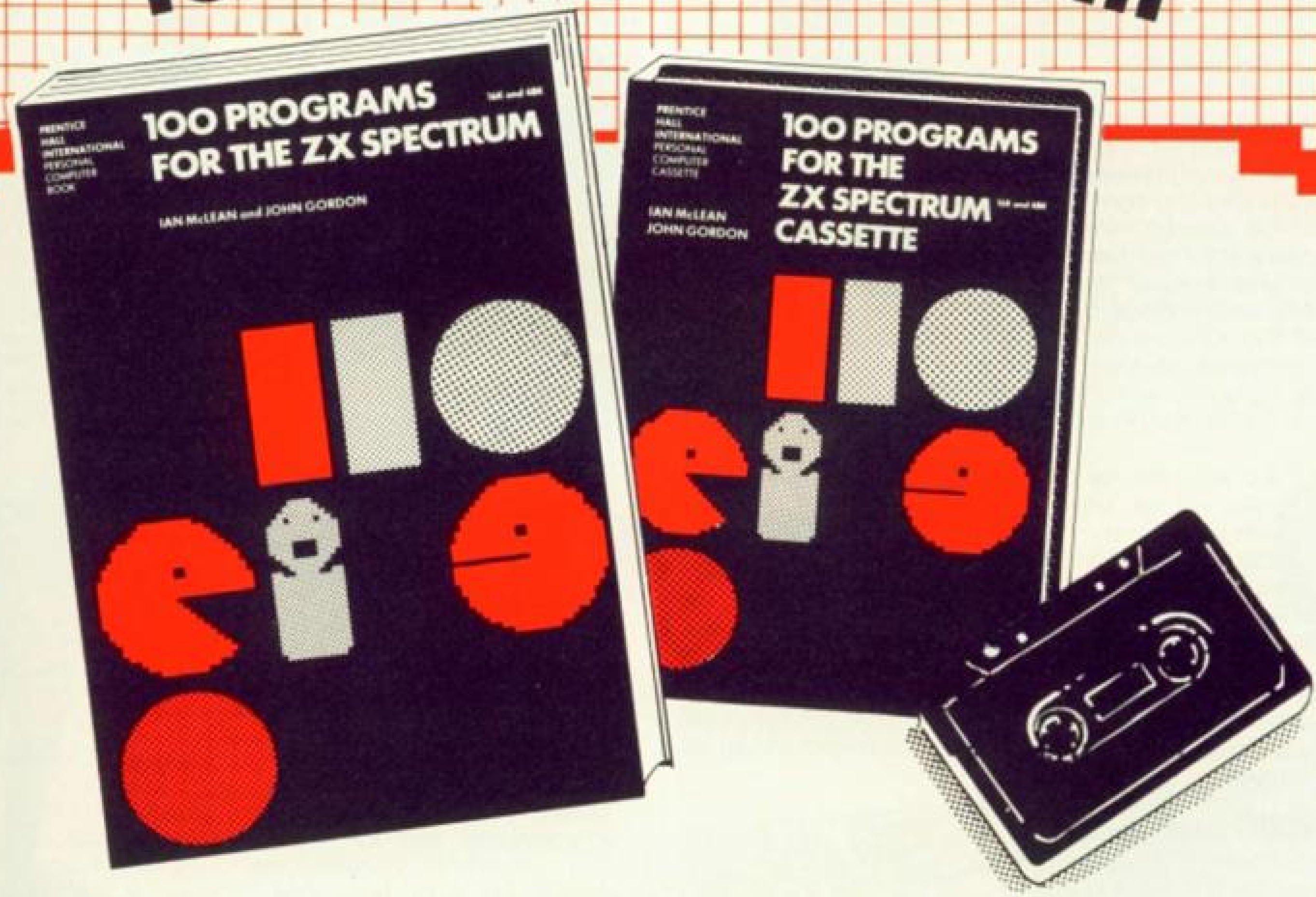
In the final stage of the game, you have to land your ship on the yellow landing pad. To control your ship you must use the 'r' key to manoeuvre.

If, at the end of the game, you accidently break out of the program, re-start with GO TO 45. If you RUN the program, you will receive an 'out of data' message and you will destroy the 'high score' facility.

```
   1 FOR f=0 TO 7
   2 READ a: POKE USR "L"+f,a
   3 NEXT f
   4 DATA BIN 00000000,BIN 01000
010,BIN 10011001,BIN 10111101,BI
N 11111111,BIN 10011001,BIN 0100
0010,BIN 00000000
  10 FOR f=0 TO 7
  20 READ a: POKE USR "P"+f,a
  30 NEXT f
  40 DATA BIN 01111110,BIN 00111
100,BIN 00011000,BIN 01111110,BI
N 01111110,BIN 01111110,BIN 0101
1010,BIN 00011000
  41 LET high=0
  42 PRINT "              EXPEDITION
                    You have been chall
enged to      explore this excitin
g space mazeand return home ALIV
E !             There are 4 section
s:            1> Missile tunnel.Ke
ys5,8.        2> Asteroids.Keys 5,
8,0 to fire.     -20 points each
shot,+100          per hit."
  43 PRINT "3> Winding tunnel.Ke
ys 5,8.              Avoid space cra
ft.           4> Landing pad.Keys
5,8,r to          retro-boost.Lan
d on the             yellow part."
  45 PRINT "Any key to start !!!
"
  46 IF INKEY$="" THEN GO TO 46
  50 LET a=15: LET sc=0
```

```
70 BORDER 1: PAPER 1: INK 0: CLS
80 PRINT AT 21,0;"[redacted]"
90 FOR f=1 TO 200
95 IF a<=9 OR a>=17 THEN GO TO 900
100 PRINT AT 0,a;"P"
110 POKE 23692,255
112 LET a=a+(INKEY$="8")-(INKEY$="5")
117 PRINT AT 21,0;
120 PRINT AT 21,INT (RND*7)+10; INK 6;"↑"
130 PRINT INK 4;"[redacted]"
140 LET b=ATTR (0,a)
150 IF b<>8 AND b<>12 THEN GO TO 900
155 LET sc=sc+1
157 BEEP .005,0: BEEP .005,-2
160 NEXT f
170 FOR f=1 TO 22
180 PRINT AT 0,a;"P"
190 LET a=a+(INKEY$="8")-(INKEY$="5")
195 POKE 23692,255
200 PRINT AT 21,0;"  "
210 PRINT "  "
220 LET b=ATTR (0,a)
230 IF b<>8 AND b<>12 THEN GO TO 900
240 LET sc=sc+1
250 BEEP .01,0: BEEP .01,-2
260 NEXT f
270 PRINT AT 0,a;"P"
280 PRINT AT 10,10; FLASH 1;"Score ";sc
290 FOR f=1 TO 5
300 FOR n=10 TO 20
310 BEEP .1,n
320 NEXT n
330 NEXT f
340 PAUSE 250
342 BORDER 2: PAPER 2: CLS
343 PRINT AT 0,a;"P"
345 FOR f=1 TO 3
350 BEEP .2,-2: BEEP .3,-2: BEEP .5,3.2
360 NEXT f
370 BEEP 1,3.2
375 LET c=20
380 FOR f=1 TO 200
390 PRINT AT 0,a;"P"
400 LET a=a+(INKEY$="8")-(INKEY$="5")
410 IF INKEY$<>"0" THEN GO TO 480
415 LET sc=sc-20
420 FOR n=1 TO 21
430 PRINT AT n,a; INK 6;"I"
435 NEXT n
440 IF a<>c THEN GO TO 470
450 LET sc=sc+100
460 FOR x=1 TO 30: PRINT AT 21,c; INK 6; PAPER 0; FLASH 1;"#": NEXT x
465 LET c=20
470 FOR n=1 TO 21: PRINT AT n,a;" ": NEXT n
480 POKE 23692,255
481 PRINT AT 21,c;"  "
485 PRINT AT 21,0; INK 3; BRIGHT 1;"###";AT 21,31; INK 3; BRIGHT 1;"#"
490 PRINT "  "
500 PRINT AT 21,(RND*30); INK 4;"©"
520 LET b=ATTR (0,a)
530 IF b<>16 THEN GO TO 900
540 LET c=c+(RND>.5)-(RND<.5)
555 BEEP .005,0: BEEP .005,-2
557 PRINT AT 21,c; INK 1;"L"
560 NEXT f
570 FOR f=1 TO 22: PRINT AT 21,0;"  ": NEXT f
575 BORDER 3: PAPER 3: CLS
580 PRINT AT 0,a;"P"
590 PRINT AT 10,10; FLASH 1;"Score ";sc
600 BEEP 1,9: BEEP 1,10.7: BEEP 1,9: PAUSE 130: BEEP 2,0
605 LET tu=13
607 PRINT AT 10,10;"  "
610 FOR f=1 TO 172
620 PRINT AT 0,a;"P"
630 LET a=a+(INKEY$="8")-(INKEY$="5")
640 POKE 23692,255
650 LET tu=tu+(RND>.5)-(RND<.5)
660 LET tu=tu+(tu<1)-(tu>24)
670 PRINT AT 21,tu; PAPER 3; INK 0;"  "
675 IF RND>.7 THEN PRINT AT 21,(RND*5)+tu; INK 1;"L"
680 PRINT INK 7; BRIGHT 1;"[redacted]"
685 IF f>149 THEN PRINT AT 21,0; PAPER 3; INK 0;"  "
690 LET b=ATTR (0,a)
700 IF b<>24 THEN GO TO 900
705 LET sc=sc+1
710 BEEP .005,0: BEEP .005,-2
720 NEXT f
730 BORDER 0: PAPER 0: INK 7: CLS
732 PRINT AT 0,a;"P"
734 LET g=INT (RND*30)+1
735 PRINT AT 15,0; INK 1;"################################"
736 FOR f=16 TO 21: PRINT AT f,0; INK 2;"[redacted]": NEXT f
737 PRINT AT 15,g; INK 6;"#"
738 LET x=0
739 PAUSE 150
740 PRINT AT x,a;"P"
750 LET a=a+(INKEY$="8")-(INKEY$="5")
755 LET a=a+(a<0)-(a>31)
760 LET x=x+1
765 PAUSE 5
770 IF INKEY$="0" THEN LET x=x-1
780 IF x>=15 THEN GO TO 800
785 BEEP .005,0: BEEP .005,-2
790 PRINT AT x,a;" ": GO TO 740
800 IF a<>g THEN GO TO 900
810 PAPER 0: INK 7: FLASH 1: CLS
820 PRINT AT x,15;"P"
830 PRINT AT 17,10;"SCORE ";sc
832 IF sc>high THEN LET high=sc
833 PRINT AT 18,10;"HIGH ";high
835 CIRCLE 125,85,80
840 FOR f=1 TO 20: BEEP .01,f: NEXT f
850 GO TO 920
900 CLS : PRINT AT 10,0;"You have crashed.Score:";sc;".  "
915 FOR f=0 TO -10 STEP -1: BEEP .01,f: NEXT f
920 PRINT : PRINT "PRESS Y FOR ANOTHER GO,N TO STOP"
930 IF INKEY$="" THEN GO TO 930
935 FLASH 0: CLS
940 IF INKEY$="y" THEN GO TO 45
```

new – a unique software library for your ZX Spectrum



For both the 16K and 48K versions of the Spectrum, the 100 programs in this large-format paperback and cassette provide a unique software library for the new user. Games, business applications, graphics, science, mathematics and home uses are among the topics covered.

A cassette containing the 100 programs, with a booklet that explains how to load and run the programs, is available as an optional extra.

☐ £7.95 paperback c. 220 pages 13-634766-5 December '83

☐ £12.50 cassette including VAT 13-634774-6 January '84



Published in June '83—a practical guide to the ZX Spectrum, ideal for first-time users. Graphics, sound and making music on the Spectrum are special features of this book.

"The straightforward text is well written, punctuated by cartoons and over 170 helpful diagrams . . . a handy book that complements Sinclair's own manual very well." **Electronics and Music Maker**

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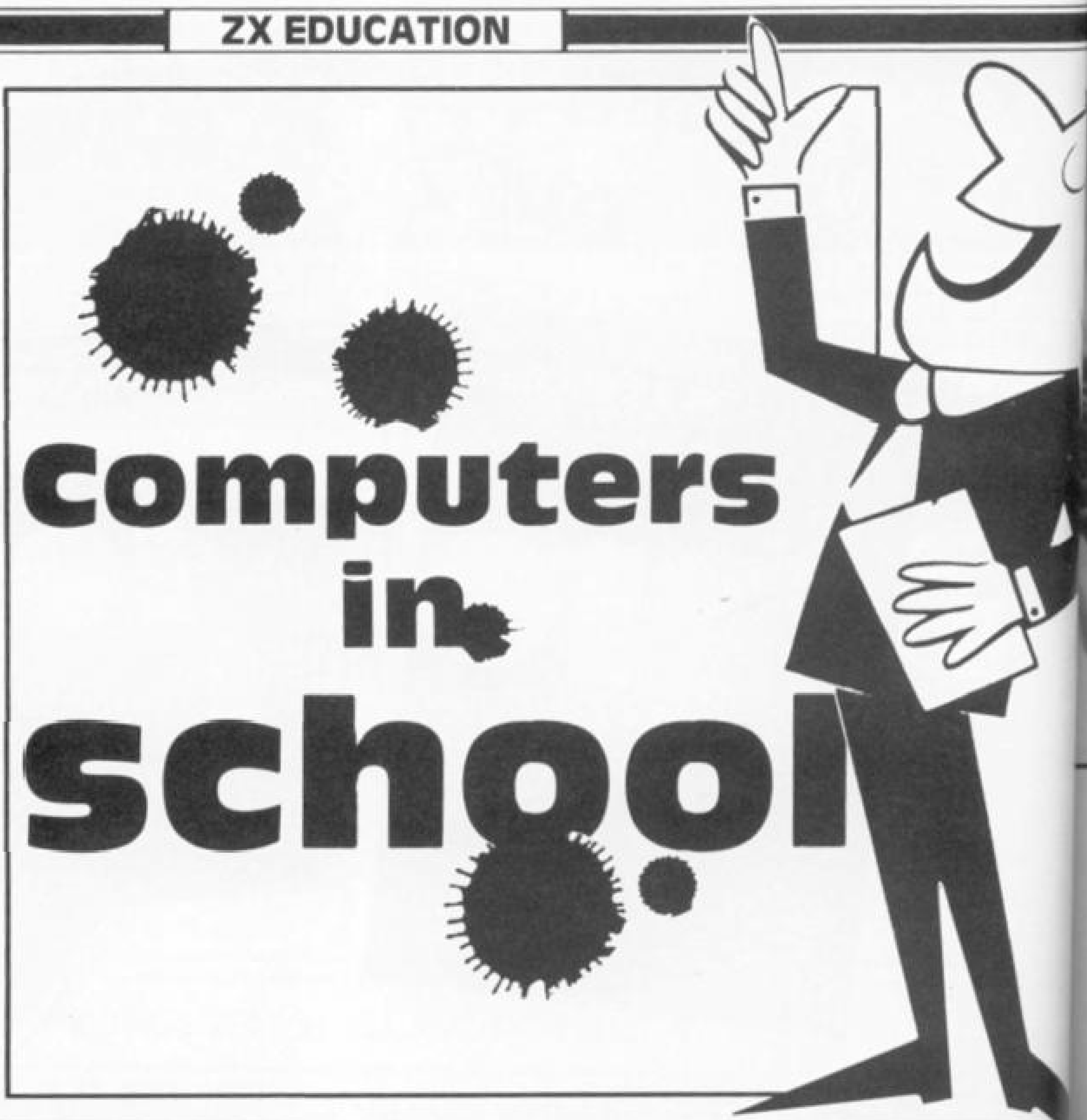
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Prentice/Hall International

ZX1



Computers in school

Are they just another educational toy asks John Bourne, Resource Centre Co-ordinator at Elphinstone School in Hastings.

Now that the Government scheme is underway to place a computer in every primary school we should be asking ourselves if we need it, and what we will do with it.

Those of us who have been pioneers in computer work in the primary school are aware of the many snags that await the unwary and we can, hopefully, give advice to the newcomer.

First of all it will soon become apparent that in any primary school of average size one computer will not be enough. Indeed, it would be true to say that most schools would need at least five to ensure a profitable approach from this new educational tool. With this in mind we must carefully consider which micro we opt for in the first place.

In our school we went for the ZX81 against the advice of many of the experts but with encouragement from those who really knew what would best suit newcomers to the subject. The ZX81 is not included in the government scheme, more's the pity, but of the three that are included I would certainly opt for the Spectrum for the following reasons.

1. It is inexpensive when compared with the others.
2. It is fairly easy to operate and understand at the level needed.
3. It will cope with anything that a primary school is ever likely to need and, indeed, many of its functions will never be used.
4. Although it is a colour computer it doesn't have to operate on a colour monitor (or TV).

Now many of the experts will tell you to go for one of the other models but think carefully. If you wish to increase the number of computers then could you possibly afford to do so when the full price is chargeable to your capitation or school fund? And remember, many of the experts are COMPUTER EXPERTS not necessarily those whose really know the needs of primary children. Indeed by the very nature of their activities they would probably find it difficult to understand the requirements of young children setting out on the adventure of computer studies.

Also, it is correct to say that when you obtain your computer it will be rapidly superceded by a newer model (a fact that matters little to the primary school) and, no matter what you pay, at the end of 12 months you are on your own when something goes wrong — and it probably will. You are left to pick up the repair bill and the more expensive the original the greater will be the charge.

So you've received the bright new addition to the school hardware. What on earth are you going to do with it? There are four main options open to you.

1. Individual or group tuition using software that teaches — an impressive teaching machine.
2. As a classroom animated blackboard. Pie charts, bar graphs, etc.
3. An addition to the office hardware. Pop in all the school records.
4. As a tool of the present and future that children learn to use and understand.





I don't think the Ministry would rate option 3 as what they had in mind for the scheme and there could, of course, be a fifth option — a dust covered object in some corner of a cupboard.

On the whole if one studies the educational press or looks in the computer magazines you could be forgiven if you thought that the computer offers only options 1 and 2 to the primary school teacher. The whole emphasis is on SOFTWARE. Cries are going out from educational publishers, I received two this week, for teachers (or indeed anyone) to produce software for the junior market. It will then, no doubt, be well packaged, well presented, accurately recorded and expensively priced.

I do not blame the publishers for this for that is what their business is all about. They know full well that the vast majority of teachers who use the new-fangled gadget will need the constant back up of these resources to convince everyone, including themselves, that computers are the in-thing and everyone should have one.

I believe that option 4 should be the number one priority. Only then will the machine serve a really useful purpose and justify the capital outlay. At Elphinstone we have the largest Resource Centre in a junior school in South East England and we made a positive decision to move into computer education some time ago. We opted for the ZX81 because it enables us to install five machines with SAVE/LOAD facilities plus one print out and individual TV monitors for a cost of just over £600.

Four of the machines are permanently installed in the Centre and these are available for use by any member of staff or children at any time and they are constantly in use. We have overcome all the problems of LOAD/SAVE, crashing, etc. by the way in which the machines were installed. We have also made a number of software programs, have purchased a few which we thought might be useful and have taped many from computer magazines. Our software library is not the main priority and is used on a fairly irregular basis. It is used only when it is USEFUL.

As our top priority would be the need to familiarise all children with the cababilities of the machine (within their understanding range), we decided to produce a learning programme that would enable them at the end of their junior school course to write and operate fairly useful computer programs taking their ages into consideration.

We ran an inservice course within the school for our teaching staff to introduce them to computers and to show the many varied ways they could be used but with the emphasis on teaching children, and the staff, to program.

Our first and second year children receive introductory talks and example lessons throughout the year to arouse their curiosity and we have prepared two text books of lessons for the third and fourth year children. Each year text book consists of ten lessons which take about an hour (it could be two half hour sessions) and they are followed by individual work requirements. At the back of each booklet is a pocket containing a mock-up keyboard. At the completion of each course work sheets are available so that children can practice their skills and improve their techniques. In this way every child in the school is given the opportuinity to understand the technology of the future.

In all fairness one has to say that the preparation of such material takes time and effort. It needs a member of staff who understands the needs and abilities of the primary school child, is aware of the aims of the school, has a working knowledge of the computer in use but does not have to be a computer expert.



I fear that the main problem will be that, in spite of advertising and what they are told by educational publishers and computer manufacturers, the teachers will find that it is NOT EASY to understand computer language unless you are prepared to make a considerable effort.

It is for this reason that I fear for the future of the computer in primary education. It may become nothing more than a nice new educational toy or a teaching machine in many schools. It will gobble up large quantities of software, much of which will be unsuitable, or it may finish up as a convenient tool in the school library acting as an electronic catalogue. In a number of cases, teachers with sufficient time will find they cannot understand the wretched thing and it will creep into the corner of some dusty storeroom or stock cupboard. Those who have tried it and declared it wanting will label it as another new gimmick that is educationally unsound. This happened initially with TV, video, visual aids apparatus and calculators but the wreteched things refused to go away.

Think well before you choose, plan well before you use, don't be too ambitious and realise from the very beginning that todays children are electronic button pushers and they won't let you get away with writing off the computer. Good luck to you. You will, with the correct approach, discover that computers in the primary school are really valid educational machines and as an added bonus THEY ARE FUN.



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competition



COMPETITION

At *ZX Computing* we always try and make our competitions a bit off the beaten track, so here's a few simple questions for all you film and television fanatics!

Many films for both the large and small screens have featured computers — this month we're asking you to tell us the names of four well known electronic characters who have become stars in their own right. Easy isn't it!

All you have to do is study the given clues and when you think you have found the answers, fill in the coupon and send it to us complete with your name and address. Finally, please could you also write your answers on the back of your sealed envelope.

The prizes

There is only going to be one prizewinner this month, but what a prize! The owner of the first correct entry drawn from our all-prpose dustbin will receive a superb Alhphacom 32 printer kindly donated to us by Dean Electronics. You only have to read my review in this issue to find out just how impressed I am with this machine. If only I could enter the competition myself . . .

1. Stanley Kubrick's spaceship computer blew a few chips in the year 2001 ....
2. The fitting of this computer to David Knight's car means Pontiacs will never be the same again ....
3. This big computer was involved by Joshua in a very dangerous war game..
4. Who is the latest ship bound servant on Blake's Seven? ....
....

Name..

Address...

....

..............................Postcode......................

The rules

• This competition is open t[o] all UK and Northern Irelan[d] readers of ZX Computin[g] except employees of Argu[s] Specialist Publications Lt[d] their printers and distributor[s] and employees of Dean Elec[tronics.] This restriction als[o] applies to employee's famili[es] and agents of the companie[s] or anyone else associated wi[th] the competition.

• As long as the correct cou[pon] is used for each entr[y] there is no limit to the numbe[r] of entries from each indiv[i]dual.

• All entries must be pos[t]marked before March 31 198[4]. The first prize will be awarde[d] to the first correct entry picke[d] at random.

• The winner will be picked b[y] the Editor of *ZX Computing*. N[o] correspondence will b[e] entered into with regard to th[e] results, and it is a condition o[f] entry that the Editor's decisio[n] is accepted as final.

• The winner will be notifie[d] by post and the results of th[e] competition will be publishe[d] in a future issue of *ZX Computing*.

Address your entries to:

ZX Computing — Electroni[c]
Stars Competition
1 Golden Square,
London W1R 3AB



Competition

Results

Well, all you keen-eyed readers, thank you for all the entries to the Spot the Difference competition in the Oct/Nov issue of *ZX Computing*. We had great difficulty finding a hat big enough to put all the entries in, but the Editor came up trumps again!

The ten first prize winners were:

P V G Atkins of Argyll
James Seabrook of Sevenoaks
Tony Louzado of London N16
J M Clements of Sidcup
R T Tacey of Manchester
Ian Heath of Wirral
Richard Eagles of Bromley
A Carswell of Paisley
David Fensom of Lutterworth
Lee Wright of Bexley

The ten runners-up were:

A Bailey of New Malden
R Mackinlay of Poole
Mark Webber of Long Eaton
Roger Saunders of Norwich
E W Fairweather of Lincoln
D W Phillips of Hayling Island
A Porter of Plymouth
Robert Amey of Norfolk
Agavanakis Kyriakos of Athens
Steven Dowland of Peterborough

Congratulations to all the above who spotted the eleven differences in the two cartoons, and commiserations to all those of you who entered but didn't get picked — you can't win them all.



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• With Sinclair's worldwide sales approaching 2 million and further product range expansion planned, a huge new warehousing centre of 32,500 square feet has been opened for Sinclair Research at Frimley, Surrey, by its sole UK distributor, GSI (UK) Limited.

As a result GSI now employs up to 145 staff at any one time on Sinclair work, an increase of 130% over the last year. This new £220.000 warehouse more than quadruples GSI's existing capacity to provide retail distribution, mail order and computer services for Sinclair. Storage capacity has risen from 28 to 2000 units and there are now eight packaging production lines against two previously. Just working on a basic one-shift day GSI can now handle up to 250,000 hardware products, 300,000 phone calls and 100,000 phone calls in just one month (that's almost as good as the ZX office!).

Sinclair's managing director, Nigel Searle thinks that there are good prospects for further growth in 1984 and states that "larger premises are vital for both expansion and streamlining, they give us faster stock turnaround, cut unit distribution costs and enable us to further enhance the quality control function at GSI" which is good news for Sinclair and for the consumers.



• The respective companies of Sir Clive Sinclair and the Rt Hon Harold Macmillan have got together to produce a new range of educational software for children aged between five and twelve. There are nine programs in all; five in the 'Learn to Read' series based on Macmillan's popular 'Gay Way' series and four 'Science Horizons' programs that explain key scientific ideas using graphic displays.

Ex-primeminister Mr Macmillan said that "since the business was founded in Cambridge in the 1840's, it has been our primary concern to ensure that the finest educational and instructional books and material are available to the young people of this country and I am pleased that in my 90th year my family business continues this worthy tradition by joining Sir Clive Sinclair in this technological advance".

Sir Clive replied by saying that "we're proud of our association with Macmillan Education and the software which has resulted from it. The programs combine fun and work to attract and hold the children's attention — while at the sametime explaining complex ideas".

The Learn to Read series takes an early reader, aged five to seven, from letter recognition to positional language — actively demonstrating words and phrases like 'in front of' or 'inside'. Reading and the alphabet are taught by friendly animal characters and a 'reward' system gives children the chance to see their achievements grow.

Science Horizons also makes good use of the computer medium by teaching science concepts to eight to twelve year olds through real-life simulations. In Glider, for example, the 'pilot' must take into account the time of day, cloud cover and terrain below as he tries to keep the glider airborne for as long as possible. Survival models the natural world of hazards that wild animals face in their struggle to stay alive while Magnets explains the idea of the magnetic forces of attraction and repulsion in an exciting board game. Finally, Cargo simulates the problems facing a cargo ship captain as he plans his itinery. Plimsoll line principles are learned as the child balances the load to avoid capsizing or sinking.

All these programs are prices at £9.95 and are available from Sinclair Research.

• Micro-PROLOG, a version of the advanced logic programming language PROLOG which was developed for Sinclair Research by Logic Programming Associates, is now available for the ZX Spectrum.

The first PROLOG adaptation for micros, micro-PROLOG uses simple 'English' phrases as the basis for a dialogue between computer and user and as such is extremely flexible and offers great potential for educational uses. It is available in cassette form with user manual and a copy of the micro-PROLOG Primer at £24.95. A separate reference manual for advanced micro-PROLOG users is in preparation.

manager. "They incorporate moving graphics with changing characters which hold a child's attention and make learning fun".

• Blackboard Software has also developed six new educational programs for Sinclair Research. Designed to teach spelling and punctuation, these programs are very different from most educational software says Alison Maguire, Sinclair's software development

Among the programs are Early Punctuation, Speech Marks and The Apostrophe in which animated men and animals drop the correct punctuation into place at the user's suggestion and you can make apples grow on trees by correctly identifying words for capitalisation in Capital Letters!

Castle Spellerous is a spelling game with ten levels of vocabulary. By answering the questions correctly the child can use his band of soldiers to try and rescue the beautiful princess who is imprisoned in the castle. Finally, Alphabet includes three games of letter recognition to help children learn the alphabet while at the same time familiarising themselves with the computer keyboard.

All the Blackboard Software for the 48K Spectrum is designed for us both in the classroom and at home for children aged between five and twelve and is priced at £7.95 per program.

• One of the newest Spectrum programs bearing the Sinclair banner is "Chequered Flag", a fast-paced companion to Flight Simulation. The game simulates a hair-raising drive around five of the worlds famous racing circuits or fire specially designed courses. Developed for Sinclair by Psion, it is priced at £6.95. ▶

There's been a wealth of new software released over the last few weeks! Here I'll try to give a brief summary of some of the latest we've received. These are not full reviews, but just an indication of the game, type and Editor's opinion on the few I've fed into my overworked machines.

• Dominoes for both Spectrum and ZX81 is available from Phipps Associates, 172 Kingston Rd. Ewell, Surrey. Along with the tapes in the review sections, their Adventure tape 1 is an especially good buy at £5.00 and consists of three full adventure games previously sold at £4.95 each. However, their latest programs are two Spectrum arcade games Gorgon and Black Planet both of which look very interesting.

• Making an impact on the Spectrum market is VISIONS, 1 Felgate Mews, Studland Street, London, W6 9JT. To launch their Snooker program the top class player, Steve Davis makes an appearance! I tried Sheer Panic and Pitman Seven, two challenging arcade games well worth a look. We'll be featuring some of their games in full review form in later editions.

• A & F have become a name associated with quality software, and they continue to produce the goods. One Hundred and Eighty is an interesting two player darts game simulation.

• Probably the most striking name to appear recently is Joe the Lion software. There is only one Spectrum game in their introductory range of three, called Bimbo. It appears to be an arcade game and we look forward to being able to review it properly.

• Micromega have announced that they will be exclusive suppliers to Wigfalls stores, producers of the acclaimed Luna Crabs and Haunted Hedges.

Micromega also supply programs for serious applications in personal financial management and in education in collaboration with the Longman Group. I have just tried their latest arcade games, Starclash and 3D Deathchase and I recommend that you try them as soon as you can!

• Melbourne House, famous (or infamous as some frustrated players claim) for The Hobbit, has taken over all rights to Abersoft's Forth program. The program will be redocumented before its re-emergence, and Melbourne House wax lyrical over its capabilities. They certainly seem to have an eye for class Spectrum programs, and at £14.95 this could be the leader of the genre.

• The first company to produce software to be used in conjunction with the Microdrive, (as far as I know) is Richard Shepherd Software. With a Cash Controller program for the 48K Spectrum at £9.95, up to 400 transactions can be handled under 16 headings.

Invincible Island is another of their releases and is a traditional adventure with scenic graphics provided. I ran it but didn't get very far, and, if I'd continued, this issue would still be unedited.

• Mikrogen have released "Mad Martha II" (are sequels going to become as familiar as in the cinema?) and have also improved their Masterchess program. Even though Masterchess received some criticism, it has been a constant chart entry and it is to Mikrogen's credit that they have made the effort to listen to the critics and adjust and adapt their program. ZX81 owners are also catered for by this company with the best seller ZX Chess.

• 5D Software have a very reasonable range of ZX81 software on the market at prices from £2.00 to £4.50. Two Spectrum programs are also available. Write to 5D Software, Hempland Cottage, The Green, N. Lopham, Diss, Norfolk. If they send us some review copies we'll tell you more.

• Saggitarian Software of 3 Wythburn Close, Loughborough, Leics have produced some new programs — one, called Gamespack 1, is a nice selection of games that would increase the variety of programs in your collection for £4.95. Games include Fruit Machine, Pontoon, Othello, Mustymind and Calendar.

• Look out for Tutankhamun from Micromania, an exciting arcade game for £5.95. This is a graphic-action maze game with slight adventure overtones for the Spectrum. Currently the most popular game in the Editor's household.

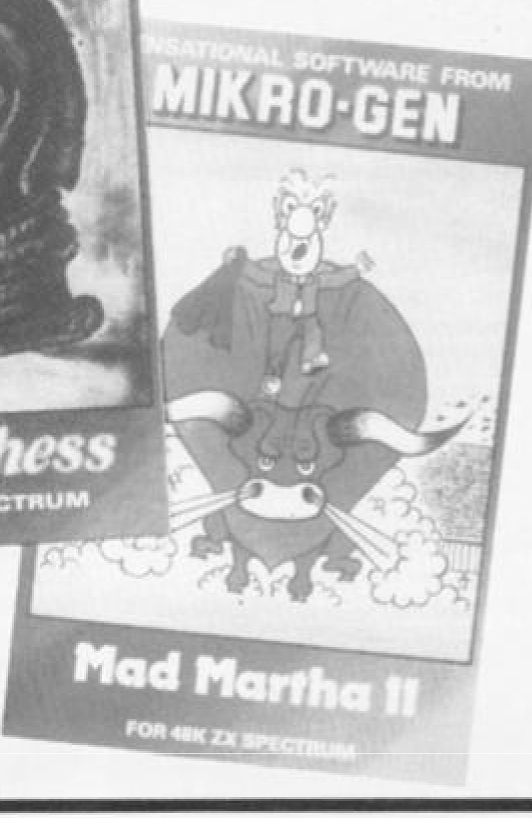
• Automata continue to puzzle and amuse with Groucho (I abbreviated the title). A quick peek told me that I had to leave it alone so I sent it for a proper review. After all, you don't want an insane Editor do you? Morris meets the Bikers is their venture into the Spectrum arcade media and a very good venture it is too.

• For those who like to use the computer to stimulate their minds, CCS Ltd continue to produce strategy and simulation games for both Spectrum and ZX81. Abyss is described as a Krypton factor adventure game, while Gangsters, Brewery, and Polaris follow the simulation style. None of their latest programs are for the '81.

• Commodore specialists, Terminal software, move into the Spectrum market with two "exciting real time graphic adventures" called Space Island (reviewed in this issue) and Vampire Village. At £6.95 each they are available from 28, Church Lane, Prestwich, Manchester.

• An interesting tape arrived from Micro-Kraft which allows choice of 12 different character sets including Greek and Hebrew. It is called Typeset and priced at £5.60. Micro-Kraft is at 48 Seacourt, Clontarf, Dublin 3, Eire.





• Sector software intends to develop new ideas using both software and board games. Their first program, Power House, has a small but attractive map supplied with the tape. I have not yet tried it but it looks interesting. Sector say that it requires logic, forward planning and quick thinking! Power House is for the Spectrum only and is available at £4.99 from Sector Software, 41 Keats House, Porchester Mead, Beckenham, Kent.

• Felix software have two adventure games which look interesting. For both ZX81 and Spectrum, Castle Colditz and Tomb of Dracula are £5.95 and £4.95 respectively (with both prices £1.00 less for ZX81 versions). Felix are at 19 Leighton Avenue, Pinner, Middx.

• Hunter Killer looked good when it was published in a monthly magazine. Now released on cassette, it is the first game to utilise the Interface I network facility and allow two independent players, on separate Spectrums, to play. This is an exciting advance and a great looking game. A single player version is also supplied for those of us who are still waiting/can't afford/not interested in the interface. Available at £7.95 from Protek at Unit 1A, Young Square, Brucefield Industrial Park, Livingston.

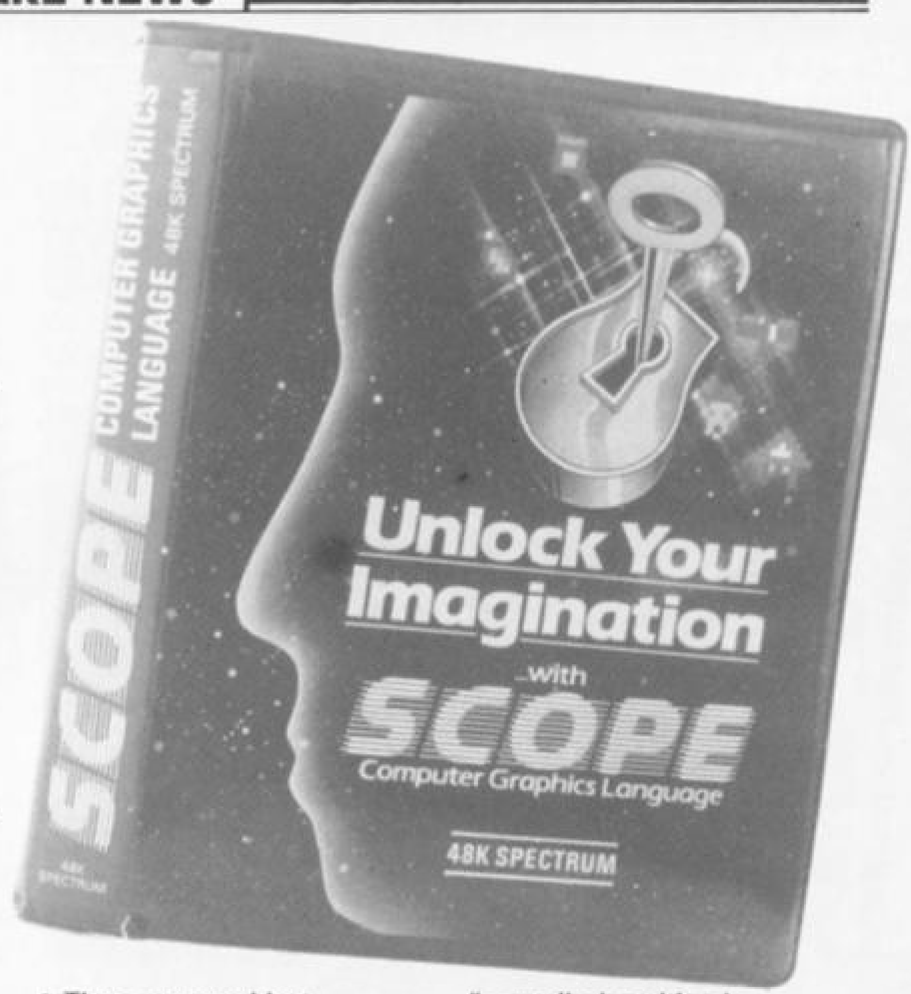
• Another interesting game is Usurper from Assassin Software (what bloodthirsty names!). This is a multi-player fantasy adventure game, the difference being that from 1 to 10 players (1 to 6 on 16K) can play. Two versions are on the tape, one for use with a map supplied and one for use with the Spectrum alone. Usurper will set you back £6.00 from Assassin Software, 10 Ash Road Leeds LS6 3JF.

• Dk'Tronics is one of the most prolific producers of software with 13 new games for the Spectrum and one for the ZX81 (only ONE!). Too many to mention here, but keep your eye open for their adverts and most stockists sell their products.

• PSS are rapidly gaining a good reputation and the release of Krazy Kong and Hopper for the 48K Spectrum will no doubt add to their following. Both these games will be released throughout Europe and Australia so all our international readers will be able to purchase copies easily.

• Rock music may be hard to compose on the Spectrum, but you can experience the trials and tribulations of seeking fame and fortune in the music business with Bigtime from a new company called Mushroomsoft. They can be contacted at 13 Harnorlen Road, Peverell, Plymouth. Mind you, you'll have to invest £4.50, but the company is making an attempt to keep their prices to a minimum.

• Supersoft Systems at 91 Manor Road, Higham Hill, London E17 5RY are selling four Spectrum games called 3D Strategy, Supercode, Pawnchess and Superfile. We haven't received any review copies so I cannot say more. (Hint, Hint)



• Three unusual but significant programs which show the varied and serious applications for which the Spectrum can be used definitely deserve a mention. Beamscan, from the company of the same name, is for architects designing steel beams; Brane Software's Cut Your Heating Bills helps you to decide how to effectively insulate your home, and Delta 7's Diet Master, one of three planned, will help you choose a healthy diet.

• ISP have produced SCOPE which they describe as a "compiled multitask language designed for writing arcade style games and graphics". Owing to its ability which enables the user to create any routine he requires, it is far superior to the usual menu driven games makers, claims managing director Alan Pendle. At £11.95 it is worth checking out.

• Bellflower's Music Maker which has received a wide range of review opinion is now available in the high street so you can see it for yourself and make your own judgement.

On a Serious Note...

• Kemp Ltd of 43 Muswell Hill, London, N10 3PN have a range of business software which is worth investigating if you want to use your Spectrum for stock control. A friend of mine uses their Stock Control in his school. Stock Ledger and other programs are available for most small business applications.

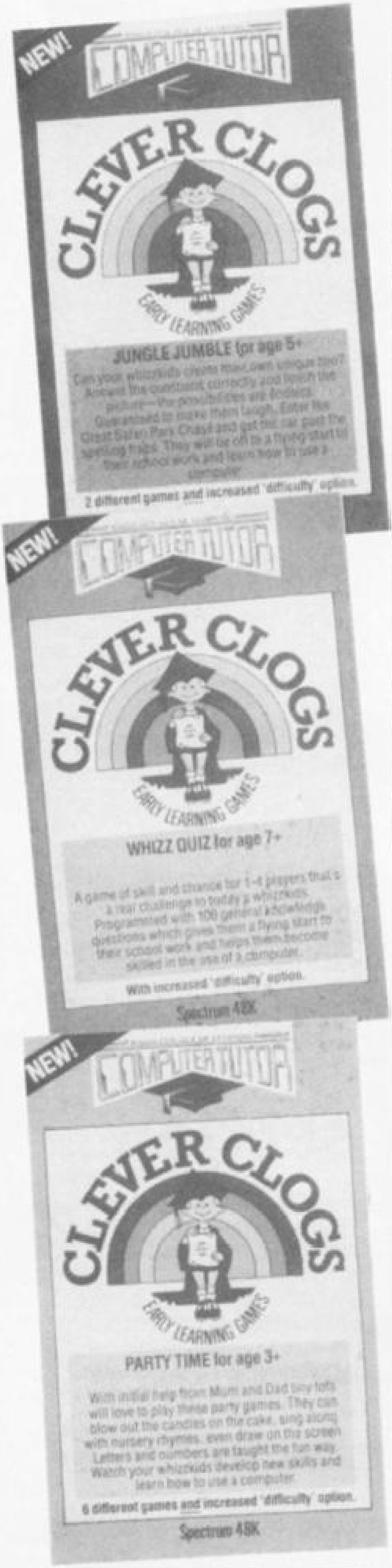
Education section...

• Mirrorsoft have entered the software jungle and decided to go for educational programs, much to their credit. Three early learning programs are the first to appear for three different machines, although eventually, versions of each program are planned for each machine. Quick Thinking is the Spectrum program and was written by Widget Software who already sell an excellent range of educational tapes.

I personally wish both companies much luck and we'll feature a full review soon. Meanwhile I'm considering having a special software review section for educational programs as so many are being released.

• Poppy Programs have added Hidden Letters to their range. I have used this program and examined the BASIC listing and can report ▶

that although it could have been improved, it is nevertheless a good program to have and is well error trapped. The price of £6.00 includes a keyboard overlay.



● Arnold-Wheaton, in conjunction with Artic Computing Ltd must be a force to deal with. They have produced a range of educational programs aimed at the older child (from eight to thirteen years). All appear to be of a high standard and we await review copies with anticipation.

● Chalksoft have increased the number of their products and have released an updated catalogue which may be obtained from 37 Willowslea Road, Worcester, WR3 7QP. The latest game is called Pirate and is described as an educational adventure. It costs £9.95 and is for the 48K Spectrum.

● Four programs on one cassette from Turtle Software for £5.95 aimed at the six to eleven age range can be obtained from Wychwood, School Road, Finstock, Oxford.

● Clever Cloggs sent us three nice looking cassette inserts for programs for toddlers aged three upwards. All are priced at £6.50 and more are promised. Obtainable from Computertutor, P.O. Box 3, St. Neots, Huntingdon, Cambs.



● Longman Software have increased their range for the Spectrum with Lunar Letters, Robot Runner, Sum Scruncher and Wild Words. All four are priced at £7.95 each and are supplied with comprehensive instructions.

● Finally, Griffin enter the arena with six programs for children aged four to nine. However, they intend to increase their range to include the much more difficult area of programs for CSE and 'O' level students. The first programs for the 48K Spectrum cost £7.99 each. We will watch for their next issue with interest.



● Joystick interfaces move into another generation with the advent of fully programmable models. Downsway Electronics produce such a model which plugs into the back of the Spectrum. All you do to program it is to press the appropriate key and move the stick in the relative direction — eight directions plus fire can be programmed in this way. The cost of this latest electronic breakthrough is £22.95 and it will work with any of the switch type joysticks like Atari, Quickshot, Competition Pro. etc. Downsway Electronics are at Depot Road, Epsom, Surrey.

● The Currah Microspeech unit has been adopted by many of the top software houses, Bugbyte, Artic and Ultimate to name but a few. The machine uses the allophone system to produce speech and costs £29.95 from Currah Computer Components Ltd., Graythorpe Industrial Estate, Hartlepool, Cleveland.





• Want to connect your Spectrum or ZX81 to a monitor instead of the TV for better clarity? With the emergence of a colour monitor for £159.95 it is as cheap, if not cheaper, than buying a colour portable. Adapt Electronics have marketed a kit which needs no soldering or special skill to fit, complete with step by step instructions. Costly? Just an amazing £2.75 plus 50p postage. Adapt Electronics can be reached at 20 Starling Close, Buckhurst Hill, Essex IG9 5TN.

• The Spectrum-Stick from Grant Design Ltd., Bank House, Reepham, Norwich, Norfolk is an ingenious device which fits on top of the Spectrum and operates the 6,7,8 and 9 keys by a lever system, eliminating an expensive electrical interface.

I tried it out and found it to work well and, although not as sturdy or responsive as many of its counterparts, it is much better than using the cursor keys. Of course, if the game uses keys other than the cursor keys then the joystick doesn't work; also it won't fit onto a non-standard keyboard.

An interesting alternative if you don't want to spend a small fortune on the normal type of joystick, the Spectrum-Stick costs £9.95.

• The Stack Light Rifle was a major attraction at the computer fairs I attended, so much so that I couldn't get a go! Six programs so far supply a range of 'shoot 'em up' games compatible with this rifle and there are more promised from major software houses.

The Light Rifle is available for £29.95 (including three games) from Stack Computer Services Ltd., 290-298 Derby Road, Bootle, Liverpool, L20 8LN.



• If you are interested in modifying and adapting your ZX81 or Spectrum to performing unusual tasks, then contact Eprom Services of 3 Wedgewood Drive, Leeds, LS8 1EF. They supply all sorts of electronic goodies, mostly in Eprom form.

• A special keyboard suitable for teaching very young children is available from Star Microterminals, 22 Hyde Street, Winchester, Hants. Each program can use a separate overlay on the large flat surface which has an 8×16 touch sensitive matrix. The overlay can be written to correspond with the input that will be required during a program run. It's much easier to press a key marked "YES" than to "Press 1 if correct".

• I found an interesting device at the bottom of my drawer, called the Petron Trichord which comes with an accompanying tape to play on the stereo. The sounds which issued forth were astounding! I investigated further and discovered that it, like many of its contemporaries, contains the AY-3-8910 programmable sound generator, but unlike most other sound generators it also contains a PROM with data for sound effects and a music program of very sophisticated ability.

One was duly supplied and I'll get a full review done on it for the next issue. Meanwhile if you want to check it out contact Petron Electronics, 1 Courtlands Road, Newton Abbot, South Devon, TQ12 2JA. It is priced between £24.95 and £29.95 depending on whether you want ZX81, Spectrum and built in amp versions.

• The high priest of Forth in this country at the moment must be David Husband whose Spectrum and ZX81 Forth ROMS turn the ordinary little computers into very fast and efficient control machines. Completely unique in design yet compatible with FIG forth, these include such advanced features as user defined split screens and multi-tasking.

If you're wondering what to do with your old ZX81 and would like to try and automate your model railway or control your house then contact David at 2 Gorleston Road, Branksome, Poole, BH12 1NW. The ZX81 Forth ROM can be bought in kit form for £25.00 plus VAT.

I have turned over the ZX81 sent to us by Davis to Peter Shaw (our hardware expert) and expect his opinion for the next issue.

• Ness Micro Systems, 100 Drakies Avenue, Inverness, tell us that they have a low-cost relay board with four channels available for the Spectrum at £24.95 plus £1.50 p&p.

Each channel has a double pole 5 amp relay rated at 1KW at 240V A/C (100W at 25V D/C). Unlike other relay boards it plugs into the Mic socket and is powered from the Spectrum's supply. The relays are activated by the BEEP command, either from a program or from the keyboard and may be daisy chained for more operators. ▶

• McGraw-Hill has brought out a series of personal computer books and software for the hobbyist programmer, small business user, and for the educational market.

Linda Hurley's book "ZX81/TS1000 Programming for Young Programmers" and its companion cassette is the first in the series. The book is intended to teach children from nine years of age how to program in BASIC, it uses games and movement and a clever set of colour-coded listings which match the ZX81's keyboard. The book costs £4.95 and the tape is £5.95.

For home and business use, there is PROFILE 1 by Colin Street, which runs on the 48K Spectrum. This is a spreadsheet type program which handles both numbers and text. Each column can be user specifed — width and number type — and each row contains a complete record. The program includes "search and replace", "find", "process" and "alphanumeric sort" functions, with provision to print out mixed text and records to the ZX printer or to several of the larger printers via a suitable interface. This is priced at £9.95.

A full function Z80 Assembler for Spectrum machine code programmers is the third and final item at the moment to be released from this company and costs £7.95.

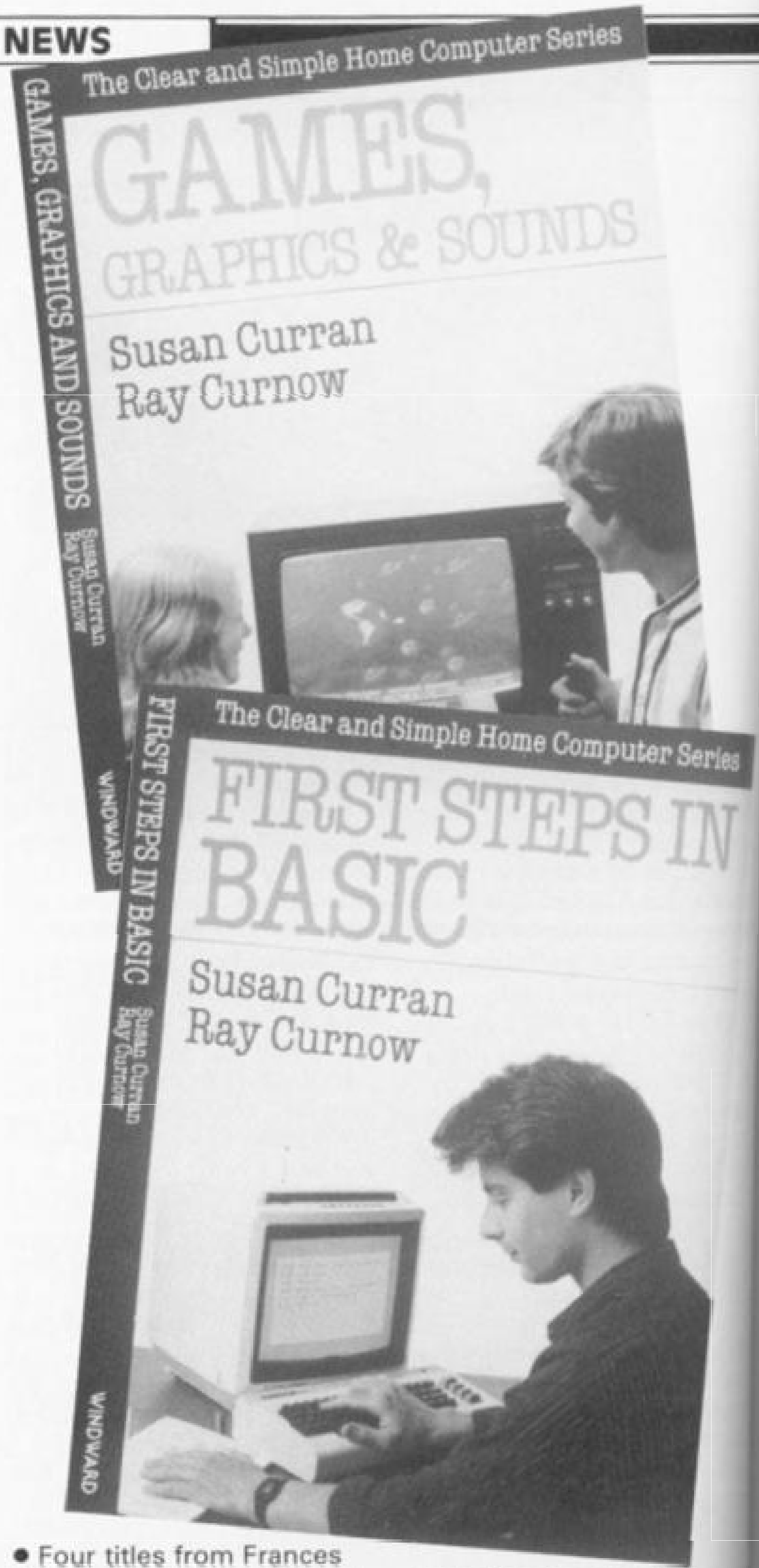
I have tried Profile 1 and the Assembler and can report that they are well documented and impressive additions to the market.

• Tim Hartnell continues to produce books which look very attractive. Tim, as regular readers will know, graces our pages with his wisdom and has been a welcome writer for us ever since he vacated the Editor's seat. His new book "Giant Book of Computer Games", is 390 pages long, costs £7.95 and is compatible with most home computers. I look forward to receiving a copy of this book from Interface publications for review.

• The Computer Bookshop of 30, Lincoln Road, Olton, Birmingham, has obtained sole distribution rights for the American SYBEX publications. These books cover a wide range of subjects from BASIC to machine code and all look very eye catching — I envy our book reviewer Patrick Cain.

• A wide range of topics are covered by publishers Butterworths and Newnes. A hundred computer related titles are available and a new colour catalogue is obtainable on request from Butterworths & Co. (Publishers) Ltd., Borough Green, Sevenoaks, Kent. We received two on programming languages FORTRAN and PASCAL and I was loathe to hand them over for review.

• LOGIC 3 has produced what must be one of the best instructional packages on the market. Called "Learn BASIC programming on the SINCLAIR ZX Spectrum", it consists of a ring-bound manual, two tapes with 20 programs, and a flowchart stencil. The manual presumes no experience whatever and progresses in a step by step manner. At £12.95 this is the perfect present for the child (or adult!) who has become bored with playing games on his Christmas gift and wants to know more.

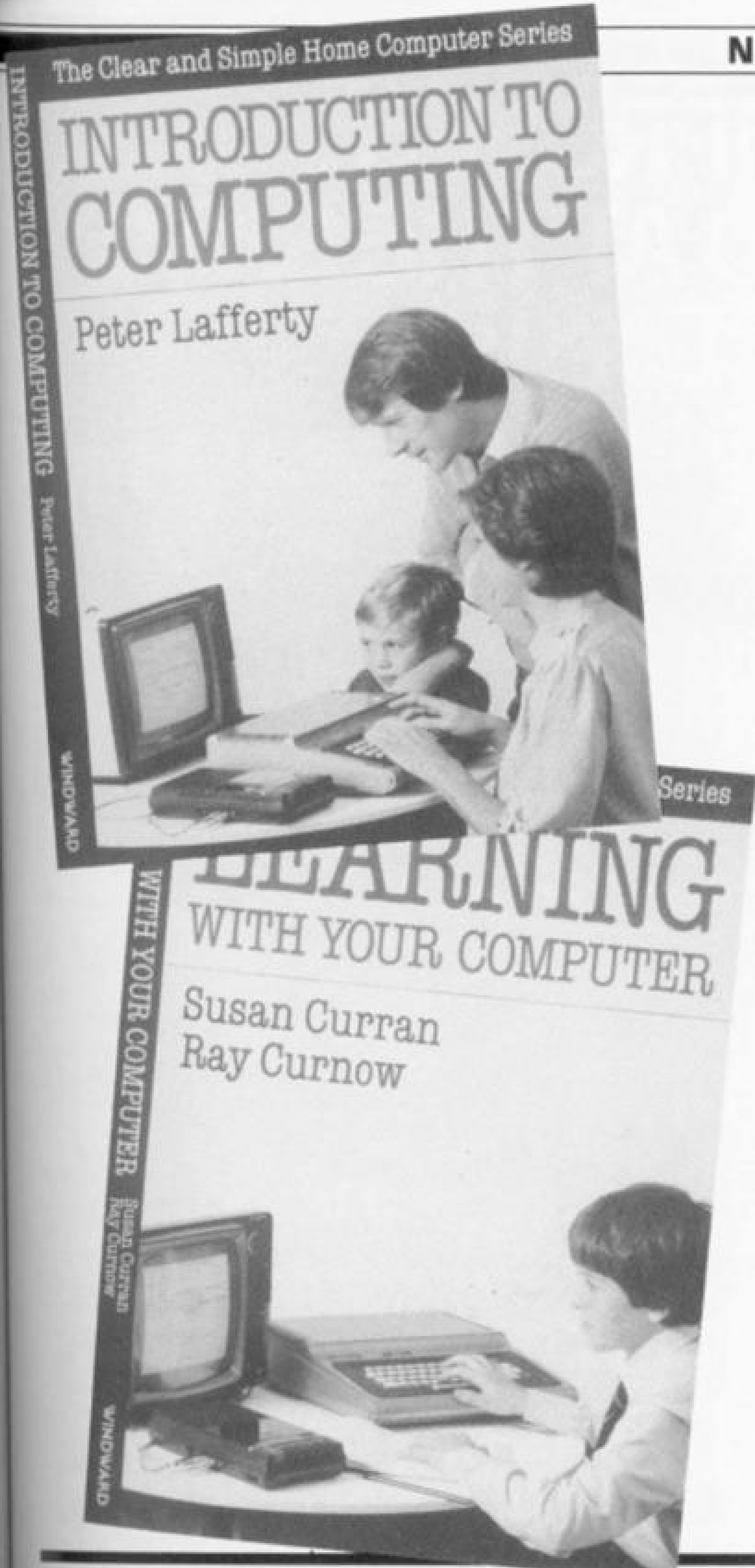




• Four titles from Frances Lincoln Publishers Ltd. and Windward under the heading "The Clear and Simple Home Computer Series" found their way to us and we hope to give you a fuller report in a future issue. A cursory (pun intended) glance revealed an attractive set of books which cover games, learning, first steps, and an introduction to BASIC. All four are priced at £4.95 each, and are multi-machine based.

• "The Microcomputer User's Handbook" from Macmillan Press is a 400 page reference book or guide to computers. It contains masses of information on computers and accessories — a must for the technological fanatic at £16.95.

• Talking of the technical side, the "Maplin Buyer's Guide to Electronic Components and Home Computers" (don't they all have long titles nowadays) contains 500 pages of kits (don't forget the ZX81 was once sold in kit form!) and electronic gizmos, computers and robots. At £1.35 it's worth getting just to browse through, and who knows, one of those items might prove irresistiblle.



• What have computers, photography and gourmet food in common? Well, Anchor Hotels are running a series of "Tailor-Made Special Breakaway" weekends at their hotels throughout the country during the period January to June 1984. The weekends include two nights accommodation with breakfast and dinner and, of course, an entertaining and practical programme on each subject.

The cost is very reasonable — £59.00 per person for the computing and photography course, and £62.00 for the gourmet weekend. A detailed brochure can be obtaiined by ringing 0252 517157.

• Webster Software, the recently formed distribution service, were overjoyed to receive the prize contract to supply 277 Boots branches with the best software titles for all major home computers. This followed a trial period when they supplied twenty branches successfully.

• Another step into the future can be seen in the opening of Adam's World in Station Road, Edgware, a shop dedicated to stocking computer ware of all sorts: books, magazines and, of course programs. Demonstration facilities are provided and Mr Derek Tidman states, "presenting and stocking what the customer wants and not what the buyer selects" is their aim. Maybe the ZX81 will get the support it deserves here!

• Software Centre Ltd. of 426 Cranbrook Road, Gants Hill, Ilford, is another retail outlet for software, but the customer has a full month in which to decide whether he is satisfied with his game — if not he can exchange it for another at 80% of its original cost. Many of the leading software houses are suppressing their natural fears of copying abuse and giving the system a try.

• A & F are taking an interesting direction with their programs. Using a feature called Ramwise, they say that now their new programs will fit into computers regardless of memory size. The programs will run but the greater the memory the greater the number of features the program will support. This means that as a computer is upgraded the user gets more from the same program.

• W.H. Smith has produced their own video program called "Introduction to Programming" in an attempt to educate us. Priced at £16.95 there are two levels; beginners and advanced and feature programs in BASIC to be transferred to the user's computer.

• Talking of Smiths, they recently tried and failed to introduce computers into their branch at sleepy Minehead, so a contact of mine tells me. After a few months of displaying a ZX81, usually in "off" mode, they were removed as being a bad sales line. A small local shop, "Minehead Radio" decided to do it properly and invested in a wide range of machines and peripherals and are now one of the most popular places in town (and making a functional success of it) good old Jack the Giant Killer stuff!

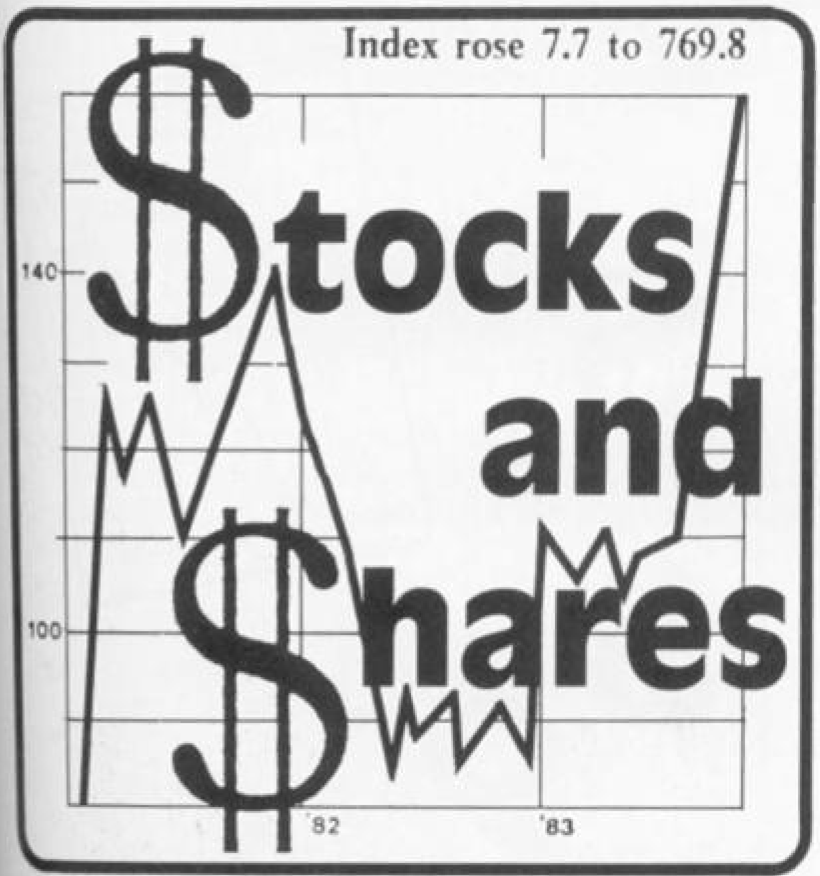
• General Accident insurance call to our attention that you should check on your insurance cover in respect of your computer. If you find that you need cover, they'll be only too pleased to speak to you...

• Prism Micro Products Ltd. are to be responsible for software marketed by Greens in the Debenhams stores. Over 200 titles are mentioned for each store, including ZX81 programs. Also, three stores have been selected for "Superstore" treatment, but they are not saying which just yet.

• I was lucky enough to get to the Bristol Home Tech. exhibition, but unfortunately most of the established producers didn't. Neverthe-less, it was quite enjoyable as many clubs were in attendance as were several of the local shops. Brensal Computers attracted a big crowd and offered bargains in the traditional way, John Holmes showed a nice line of musical instruments, and other exhibitors were full of cheer.

All the visitors I saw and met were happy, and I would like to mention "Computer Add Ons", one of the few national companies to attend, who were doing great things for customer relations at all the events I attended.

• The Northern Computer Fair was, as expected, a huge success and most of the well known names were there. Many companies launched new tapes and add-ons, and I was able to meet for the first time many of the people who had been, until then, only names on slips of paper. By the time this edition reaches you all this will be ancient history, so I'll content myself by saying, "Great man, just great!"



D Bayliss helps you to take stock of the situation with this ZX 81 game.



Written for the ZX81, this game will run on a Spectrum with only a few modifications and has the advantage that up to 10 players may take part — call in the neighbours after typing it in!

When you finally finish and RUN it, you will be asked to enter the number of players, once this is entered all the players must decide between themselves how many rounds to play. A round is completed once all players have had a turn. The game now starts.

Initially the shares table is set up, this occupies the top half of the screen, the lower half being used to display information for the players.

Five columns are shown in the shares table, these are:

1. Share title
2. Number available
3. Unit cost per share
4. Number of shares the player owns
5. Number of shares reserved by the player

On the left of the screen at the top, the number of players is shown, the top right number is the number of the player whose turn it is. The number at the bottom left of the shares table shows which round you have reached out of the total to be played, and at the bottom right of the shares table the current player's cash is displayed.

At the start and end of every player's turn he must make a decision which will influence the market, a careful decision here could help to make a killing. Once the market influence has been made then you have a menu of options which include:

This game is certain to appeal to the mercenary side of your nature, and who knows, one day the practise may prove valuable . . .

BUY	— If you press "1" then you will be asked which shares you wish to buy and how many.
SELL	— Pressing "2" will enable you to sell as many of whichever shares you wish to be rid of.
SELL ALL	— Key "3" will sell off all the shares that player owns.
RESERVE	— You may reserve shares (if none of the type you want are available) by pressing "4". As soon as a player sells any of that type then they are purchased for you automatically — strict order of priority is maintained. To cancel reservations, simply use this option and enter a NEGATIVE number equal to some or all the shares held in reserve.
QUIT	— Key "5" is pressed when a player has completed his transactions.

This program was not listed on the ZX printer; owing to an inability (so far) to print graphic symbols the following system of indicating graphic characters had been adopted.

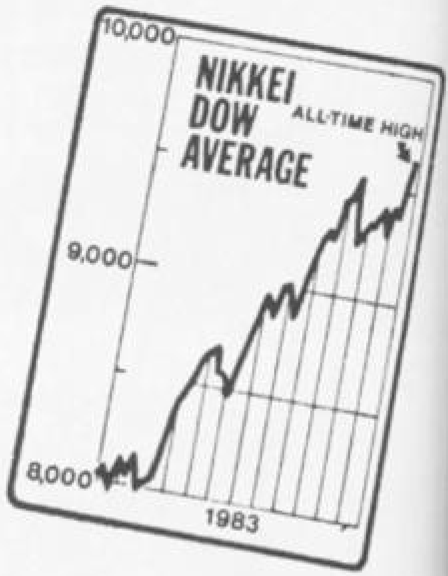
1. Inverse graphic letters will be in lower case. PRINT "a sample of inverse letters".
2. Graphic character will be enclosed in brackets PRINT "(gA + 10gD + gA)"

This would be typed as: PRINT "▒▒▒▒▒▒▒▒▒▒▒▒"

ie. ONE graphic character on key A, TEN graphic characters on key D and ONE graphic character on key A.

In this program the following lines contain ALL inverse characters, including spaces and ? etc.
LINES: 5,6,23 TO 33,210,220,1050,2020,2035,2040,2520,2540,3520,3540,5020,5090,6015,6090 TO 6120.

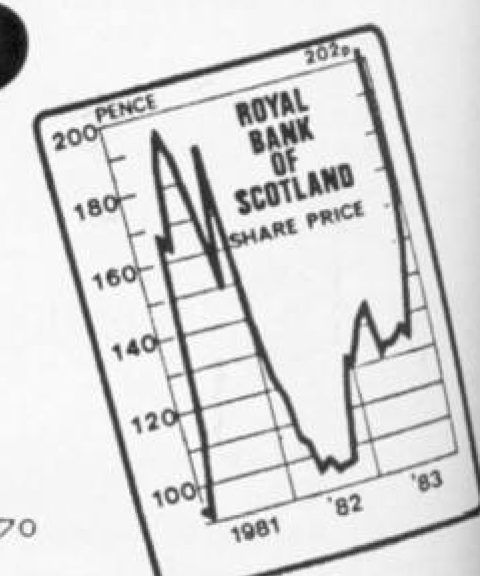
```
1 REM "stocks and shares"
2 DIM A$(10,10)
4 DIM B(10,2)
5 PRINT AT 6,0;"(10gM+12inverse spaces+10gN)";AT 10,0;"(10gM+12inverse spaces+10gN)"
6 PRINT AT 8,7;CHR$ 11;"stocks and shares";CHR$ 11
7 PRINT AT 12,2;"A GAME FOR UP TO TEN PLAYERS"
8 PRINT AT 20,7;" HOW MANY PLAYERS?"
```

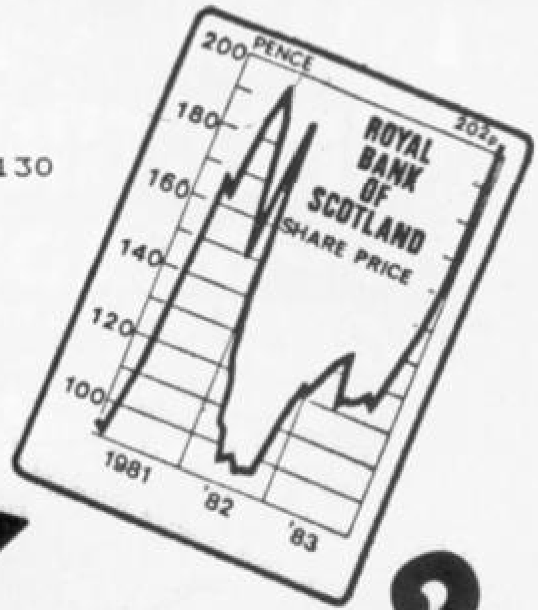



```
  9 INPUT P
 10 CLS
 11 IF P>10 THEN GOTO 10
 12 DIM A(P,11)
 13 DIM R(P,10)
 15 PRINT AT 11,7;"HOW MANY ROUNDS"
 16 INPUT END
 23 LET A$(1)="(inverse1.)+aviation"
 24 LET A$(2)="(inverse2.)+steel    "
 25 LET A$(3)="(inverse3.)+shipping"
 26 LET A$(4)="(inverse4.)+building"
 27 LET A$(5)="(inverse5.)+finance "
 28 LET A$(6)="(inverse6.)+leisure "
 29 LET A$(7)="(inverse7.)+industry"
 30 LET A$(8)="(inverse8.)+film ind"
 31 LET A$(9)="(inverse9.)+chain st"
 32 LET A$(10)="(inverse10.)+gold    "
 33 LET C$=" reserved "
 34 FOR N=1 TO P
 36 FOR M=1 TO 10
 38 LET A(N,M)=10
 40 LET B(M,1)=P*40
 42 LET B(M,2)=10
 44 NEXT M
 46 LET A(N,11)=200
 48 NEXT N
 49 LET RO=1
110 GOSUB 1000
120 FOR N=1 TO 10
130 PRINT AT N,17;"   ";AT N,17;B(N,2)
140 NEXT N
145 REM primary loop
150 FOR J=1 TO P
151 PRINT AT 12,0;"ROUND ";RO;" OF ";END
152 LET ST=1
154 PRINT AT 0,0;P;" PLAYING"
160 GOSUB 9700
170 PRINT AT 0,27;"  ";AT 0,27;J
175 IF RND>.8 THEN GOSUB 5000
180 GOSUB 6000
190 GOSUB 9600
200 LET ST=0
210 PRINT AT 13,0;"player>";J;"your options are :-"
220 PRINT AT 14,0;"1. buy";AT 15,0;"2. sell";AT 16,0;"3. sell all";AT 17,0;"4.
reserve";AT 18,0;"5.quit"
230 INPUT OP
240 IF OP<>1 AND OP<>2 AND OP<>3 AND OP<>4 AND OP<>5 THEN GOTO 230
250 IF OP=1 THEN GOTO 2000
260 IF OP=2 THEN GOTO 2500
270 IF OP=3 THEN GOTO 3000
280 IF OP=4 THEN GOTO 3500
290 IF OP=5 THEN GOTO 8000
980 IF J=P THEN LET RO=RO+1
983 IF RO=END+1 THEN GOTO 7000
985 NEXT J
990 GOTO 150
1000 REM screen
1010 PRINT AT 0,0;"(20gA)+player>"
1020 FOR N=1 TO 10
```

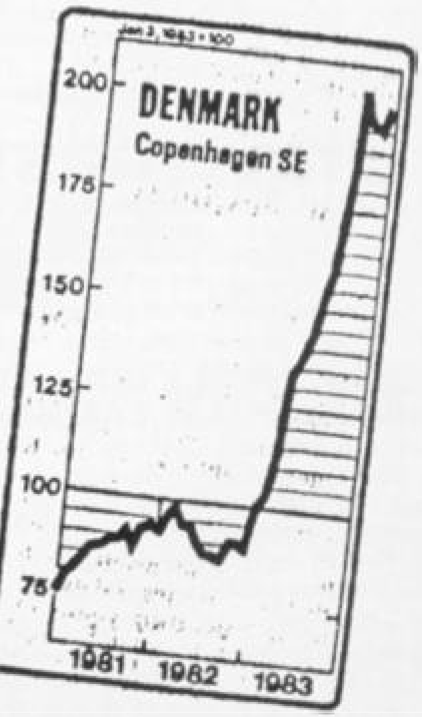
```
1030 PRINT AT N,0;A$(N);"      at#  gA+inverse- "
1040 NEXT N
1050 PRINT AT 11,0;"                          cash#"
1060 FOR N=1 TO 10
1070 PRINT AT N,27;C$(N)
1080 NEXT N
1090 RETURN
2000 REM buy
2010 GOSUB 9600
2020 PRINT AT 13,0;"what do you wish to buy ?       (1 2 3 etc)"
2030 INPUT BU
2032 IF BU<1 AND BU>10 THEN GOTO 2030
2035 PRINT AT BU,19;"<O>"
2040 PRINT AT 13,26;BU;AT 15,0;"how many do you require ?        you can afford";
INT (A(J,11)/B(BU,2))
2050 INPUT QU
2051 IF QU>B(BU,1) THEN GOTO 2050
2052 IF QU>INT A(J,11)/B(BU,2) THEN GOTO 2050
2060 PRINT AT 15,26;QU
2070 LET A(J,11)=A(J,11)-(B(BU,2)*QU)
2080 LET B(BU,1)=B(BU,1)-QU
2090 LET A(J,BU)=A(J,BU)+QU
2100 PRINT AT BU,10;"     ";AT BU,10;B(BU,1);AT BU,22;"     ";AT BU,22;A(J,BU)
2105 PRINT AT 11,25;"       ";AT 11,25;A(J,11)
2110 PRINT AT BU,19;"gA+inverse-+space"
2120 GOSUB 9600
2499 GOTO 210
2500 REM sell
2510 GOSUB 9600
2520 PRINT AT 13,0;"what do you wish to sell ?      (1.2.3.etc)"
2530 INPUT SE
2532 IF SE<1 AND SE>10 THEN GOTO 2530
2535 PRINT AT SE,19;"(inverse<O>)"
2540 PRINT AT 13,26;SE;AT 15,0;"how many to sell ?                  "
2550 INPUT QS
2552 IF QS>A(J,SE) THEN GOTO 2550
2560 PRINT AT 15,26;QS
2570 LET B(SE,1)=B(SE,1)+QS
2580 LET A(J,SE)=A(J,SE)-QS
2590 LET A(J,11)=A(J,11)+(B(SE,2)*QS)
2600 PRINT AT SE,10;"     ";AT SE,10;B(SE,1);AT SE,22;"     ";AT SE,22;A(J,SE)
2610 PRINT AT 11,25;"       ";AT 11,25;A(J,11)
2620 PRINT AT SE,19;"gA+inverse-+space"
2790 GOSUB 9600
2800 GOTO 210
3000 REM sell all
3010 FOR N=1 TO 10
3020 LET B(N,1)=B(N,1)+A(J,N)
3030 LET A(J,11)=A(J,11)+(A(J,N)*B(N,2))
3040 LET A(J,N)=0
3060 NEXT N
3065 IF RO=END+1 THEN RETURN
3100 GOSUB 9700
3200 GOTO 210
3500 REM reserve
3510 GOSUB 9600
3520 PRINT AT 13,0;"what do you wish to reserve     (1.2.3.etc)"
3530 INPUT RE
3535 IF RE<1 OR RE>10 THEN GOTO 3530
```

```
3540 PRINT AT 13,29;RE;AT 15,0;"how many ?  "
3550 INPUT RA
3555 IF RA>((P*40)+(P*10)) THEN GOTO 3550
3558 IF RA+R(J,RE)>((P*40)+(P*10)) THEN GOTO 3550
3560 PRINT AT 15,9;RA
3570 LET R(J,RE)=R(J,RE)+RA
3580 PRINT AT RE,28;"    ";AT RE,28;R(J,RE)
3590 GOSUB 9600
3600 GOTO 210
4000 REM reserve adjustments
4001 FOR Q=J-1 TO J-(P-1) STEP -1
4003 LET Q1=Q
4005 IF Q1<1 THEN LET Q1=Q1+P
4010 FOR N=1 TO 10
4020 IF R(Q1,N)<>0 THEN GOSUB 4050
4030 NEXT N
4035 NEXT Q
4040 RETURN
4050 IF R(Q1,N)>B(N,1) THEN GOTO 4110
4060 LET A(Q1,N)=A(Q1,N)+R(Q1,N)
4070 LET A(Q1,11)=A(Q1,11)-(R(Q1,N)*B(N,2))
4080 LET B(N,1)=B(N,1)-R(Q1,N)
4090 LET R(Q1,N)=0
4100 RETURN
4110 LET A(Q1,N)=A(Q1,N)+B(N,1)
4120 LET A(Q1,11)=A(Q1,11)-(B(N,1)*B(N,2))
4130 LET R(Q1,N)=R(Q1,N)-B(N,1)
4140 LET B(N,1)=0
4160 RETURN
5000 REM dividends
5010 GOSUB 9600
5020 PRINT AT 13,0;"(8gP)+dividend+(8gP)"
5030 LET DI=INT (RND*10)+1
5040 PRINT AT 14,0;"YOU RECIEVE A DIVIDEND"
5050 PRINT AT 15,0;"ALL SHARES HELD IN..."
5060 PRINT AT 16,0;A$(DI)
5070 PRINT AT 17,0;"YOU HOLD ";A(J,DI)
5080 PRINT AT 18,0;"YOU RECIEVE #";A(J,DI)*10
5090 PRINT AT 20,0;"    any key to cont     "
5100 IF INKEY$="" THEN GOTO 5100
5110 GOSUB 9600
5120 LET A(J,11)=A(J,11)+(A(J,DI)*10)
5130 PRINT AT 11,25;"       ";AT 11,25;A(J,11)
5140 RETURN
6000 REM market influence
6005 GOSUB 9600
6010 DIM I(10)
6015 PRINT AT 13,0;"market influence
6020 FOR N=1 TO 10
6030 LET I(N)=INT (RND*14+1)-7
6035 IF I(N)=0 THEN GOTO 6030
6040 NEXT N
6050 DIM Z(3)
6060 FOR N=1 TO 3
6070 LET Z(N)=INT (RND*10)+1
6075 IF N=2 AND Z(N)=Z(1) THEN GOTO 6070
6077 IF N=3 AND (Z(N)=Z(1) OR Z(N)=Z(2)) THEN GOTO 6070
6080 PRINT AT 13+N,0;A$(Z(N))
6090 IF I(Z(N))<0 THEN PRINT AT 13+N,12;"down";ABS I(Z(N))
```






```
6100 IF I(Z(N))>0 THEN PRINT AT 13+N,12;" up ";I(Z(N))
6110 NEXT N
6120 PRINT AT 18,0;"choose";Z(1);"/";Z(2);"/";Z(3)
6130 INPUT CH
6135 IF CH<>Z(1) AND CH<>Z(2) AND CH<>Z(3) THEN GOTO 6130
6140 LET B(CH,2)=B(CH,2)+I(CH)
6141 IF B(CH,2)<1 THEN LET B(CH,2)=1
6142 IF B(CH,2)>40 THEN LET B(CH,2)=40
6145 PRINT AT CH,17;"  ";AT CH,17;B(CH,2)
6150 GOSUB 9600
6155 IF ST=1 THEN RETURN
6160 FOR N=13 TO 20
6170 PRINT AT N,0;"(7gA)+next player+(9gA)"
6180 NEXT N
6190 RETURN
7000 REM end
7005 CLS
7010 FOR J=1 TO P
7020 GOSUB 3000
7030 PRINT AT J,0;"PLAYER ";J;" HAS ";A(J,11)
7040 NEXT J
7050 STOP
8000 REM prices
8005 GOSUB 6000
8006 GOSUB 4000
8010 FOR N=1 TO 10
8020 LET UP=INT (RND*4)
8030 LET DO=INT (RND*4)
8050 LET G=INT (RND*2)+1
8060 IF G=1 THEN LET B(N,2)=B(N,2)+UP
8070 IF G=2 THEN LET B(N,2)=B(N,2)-DO
8080 IF RND>.95 THEN LET B(N,2)=B(N,2)+UP+DO
8090 IF RND>.95 THEN LET B(N,2)=B(N,2)-UP-DO
8100 IF RND>.8 AND B(N,2)<5 THEN LET B(N,2)=B(N,2)+UP+DO
8110 IF RND>.8 AND B(N,2)>35 THEN LET B(N,2)=B(N,2)-DO-UP
8200 IF B(N,2)>40 THEN LET B(N,2)=40
8210 IF B(N,2)<1 THEN LET B(N,2)=1
8220 PRINT AT N,17;"  ";AT N,17;B(N,2)
8230 NEXT N
8240 GOSUB 9600
8300 GOTO 980
9600 REM cls
9610 FOR N=13 TO 21
9620 PRINT AT N,0;"
9630 NEXT N
9640 RETURN
9700 REM shares display
9710 FOR N=1 TO 10
9720 PRINT AT N,22;"     ";AT N,22;A(J,N)
9730 PRINT AT N,10;"      ";AT N,10;B(N,1)
9735 PRINT AT N,28;"      ";AT N,28;R(J,N)
9740 NEXT N
9750 PRINT AT 11,25;"          ";AT 11,25;A(J,11)
9770 RETURN
9800 REM display reserves
9810 FOR N=1 TO 10
9820 PRINT AT N,28;"    ";AT N,28;R(J,N)
9830 NEXT N
9840 RETURN
```



READERS' REVIEWS

Next time anyone claims that we are a nation of illiterates I'll just let them read your letters! I have never read so much well though out, individualistic, critical literature. The old saying 'spoilt for choice' was never so appropriate – perhaps we'll run a special supplement later in the year.



For new readers, this feature provides space to air your views on any software, be it for the ZX80, ZX81 or ZX Spectrum. If you've had a good or bad experience of any of the commercial software packages available for your micro, why not write and tell us.

Your reviews should contain your critical thoughts about the software and the relevant details concerning the availability of the package, its price, etc. If you can provide any screen dumps to illustrate the review, so much the better. Any reviews published in this section of the magazine will be rewarded with the price of the tape you review. So, if you buy a cassette and send in a review that gets published, you'll get your software for free!

Cyrus Is Chess
Intelligent Software
P D Fiddler

Rightly or wrongly, many judge a computer by its ability to play a good game of chess and every self respecting micro has at least one chess program to offer. Many commercial mainframe computers are not above a quick game of chess either and national pride is put on the line in organised International Computer Chess Tournaments – micros too have their own International Chess Competitions.

Several chess programs have been available for the Spectrum for some time, so the appearance of Intelligent Software's Cyrus Is Chess program in July accompanied by the slogan "based upon the program which won the European Micro Computer Championship 1981" must arouse some curiosity – especially as it comes with a 16 page User's Manual, and is marketed by Sinclair who already have a chess program in their Spectrum Catalogue. The Cyrus program is designed by David Levy, the Scottish International Chess Master and noted chess computer expert whose programs can be found in several dedicated chess computers.

How does the Cyrus program differ from its contemporaries? It is one of the few chess programs that fit into either the 16K or 48K models. Side A of the cassette has two copies of the 16K version whilst side B has two copies of the 48K version with some additional features. Side A (16K) loads in 90 seconds and Side B (48K) in 2 minutes. The graphics are clear and they are moved using the cursor keys: a flashing square is moved to the piece to be moved then 'entered'; the flashing square is then moved to the destination square and 'entered' again. The cursor method requires five key movements – the same number as the more usual E2 - E4 'ENTER' method – but for some reason the cursor actually moving the pieces seems closer to 'over the board confrontation'.

Cyrus has eight playing levels and three problem solving levels (mate in 1, 2 or 3) and the approximate times for each level are:

Level 1	2 secs.
Level 2	5 secs.
Level 3	10 secs.
Level 4	20 secs.
Level 5	30 secs.
Level 6	1 min. 15 secs.
Level 7	3 mins.
Level 8	5 - 12 mins.
P1	Computes until 'Mate' found.
P2	
P3	

Levels or sides can be changed during the course of the game and the board can be turned around but of more interest is the fact that the level times are faster than those stated for many 'dedicated' chess computers to be found in the shops – this should mean that you can have a worthwhile game of chess without waiting too long for the computer to reply to your move. The Cyrus program also enables the player to take back moves, up to 80 moves in the 16K program and up to the beginning of any longer game in the 48K version. The 48K program also enables a player to ask the computer to take its move back and play its next best move, then second best move, then third etc. This means that you can 'cheat' but of more importance to the chess enthusiast is the fact that you can use your computer to analyse various openings and positions. In addition by tapping the R key you can ask Cyrus to automatically replay the game for both sides up to the present position, be it a mid-game position or a final mate. This is rather like watching Mastergame on television.

In demonstration mode Cyrus will play both sides through a complete game at any pre-set level and as a bonus there is a Human v Human mode which enables two players to use Cyrus as a chessboard and pieces. This also means that a school or chess club can use Cyrus instead of a demonstration board at a quarter of the normal cost.

An impressive list of features – but how well does Cyrus play? On loading, Cyrus automatically sets itself to level 2 (response time 5 seconds). The manual states that the 48K version might be quicker in the opening than the 16K program as it has a larger opening 'book' ie it has been programmed with a larger repertoire of popular openings to respond quickly to anticipated moves.

Impressive for a 5 second response! Cyrus, then, can prove a formidable opponent.

	Human	Cyrus
1	e4	e5
2	Nf3	Nc6
3	Bb5	a7
4	B x c6	d7 x c6
5	O – O	f3
6	d4	Ba4
7	d x e5	Q x d1
8	R x d1	f x e5
9	Rd3	Bd6
10	N(b)d2	Be6
11	b3	Nf6
12	Bb2	Nd7
13	Ng5	Nc5
14	Rg3	n6
15	B x e6	N x e6
16	Rd1	O – O – O
17	Nc4	Bc5
18	Rc1	Rf8

As a further measure Cyrus was pitted against two dedicated chess computers – Morphy Encore (£140) and Mini Sensory-Advanced (£80) both of advanced design which 'think' in their opponent's time. At approximately the same response levels and playing Black in each case:

Cyrus Level 3 defeated Mini-Sensory Advanced Level 2 (29 moves).

Cyrus Level 6 had the better ▶

of the exchange and was heading for a win endgame against Morphy Encore Level 3 (44 moves).

To be fair, Morphy Encore has a lot more reserves to call up having nine levels, including two at tournament level but the fact that Cyrus did so well says a lot for the Cyrus Program and a Mate-in-Three Chess Problem was solved in a very acceptable 3 minutes.

One irritating feature of the 16K version is that it does not display the Menu of 15 options on the screen with the chess board but fills up the lower area of the screen with a rather distracting 'I S Chess' Logo. Playing strengths of the 16K and 48K versions are the same.

Apart from the larger opening 'book' and 'menu' display on screen the 48K version offers:

(a) The option of using a printer to print every move as it is made, to produce a record after a complete game or to print out the current board position.
(b) A game may be saved on tape and re-entered into the computer's memory later.
(c) The colours of the screen display can be changed.
(d) In problem mode the 48K will display 'NO MATE FOUND' if it cannot solve a problem in the number of moves stipulated.

An unusual feature for both the 16K and 48K versions is that Cyrus will announce a DRAW if no pawn is moved or piece captured during a sequence of 50 moves or if both sides move the same pieces backwards and forwards over the same squares three times running. This is in accord with the rules of chess but is a feature not to be found in many other computer chess programs. In conclusion, Cyrus is a strong yet flexible chess program suitable for both beginner and chess enthusiast, even if you already have a chess program for your Spectrum you will be fascinated by this one!

Frenzy
Quicksilva
Roy Kay

Adaptations of arcade favourites are still a major part of the micro games industry, and with FRENZY, Quicksilva have produced a game that fans of the genre will recognise and enjoy.

There's an infinite number of maze-like rooms for you to guide your little man around, five levels of cunningly villainous robots, a minelayer, exploding pods – and, of course, the ultimate and unstoppable 'Evil Orville'.

On loading, Frenzy goes into its attract mode which consists of details of play keys, a score breakdown and a sample screen of yellow, first level robots. Controls are straightforward enough, although I would have preferred bottom row keys in place of the selected cursor ones. Later copies of the game will have a built in Kempson joystick option, but if your game does not have this, don't despair – Frenzy is included in Kempson's "Conversion Tape 2".

Depending on how nimble-fingered or otherwise you are, it might take you some time to get the feel of the movement keys. For the first few plays, I found it annoyingly easy to confuse 'up' with 'down' – in spite of the QS key overlay which is included here – thereby dooming myself to premature electrification and losing one of my precious three lives. A joystick should make a big difference to the game's playability.



This brings me to my major complaint against Frenzy. The game has a high score table which allows you to put a name to five high scores. However, there is no preset low limit and so Frenzy thinks anything you score after loading is a "GREAT SCORE!" and announces it accordingly. It's more than a little frustrating to have to sit through the routine, colourful and tuneful as it is, even when you've only managed to score 40 points or so in the early stages of getting to grips with the game. As the table works for the five highest scores in any game session, you are going to have to put up with this for at least your first fives games, and very probably, considerably more often.

Is a score table such a good idea anyway? I would hazard a guess that most people play computer games on their own, and so have no real need to enter their initials as they almost certainly already know them. A 'Hall of Fame', allowing you to make a copy on a printer, might have been a more interesting alternative, giving you the opportunity to brag about your superior skills to your wife/girlfriend/boyfriend/mother/father/friends or anyone else you could persuade to listen. In any event, the Frenzy score table should have had an inbuilt low limit of, say, 800-1000. Then, having a "GREAT SCORE!" would really have given you a glow of pride instead of, as at present, giving you a red glow of seething frustration.

The game itself is all about getting the robots before they get you. They certainly look menacing enough with their eye-scanners sweeping left and right watching your every move. The robots are intelligence itself, particularly at the higher levels. Reacting to your movements, they have no intention of being 'sitting ducks'.

You are allowed to fire only in in the direction that you first moved, so skillful play is needed to wipe out even all the first level robots. Higher levels contain higher scores (but more devious and deadly) robots, mines and exploding pods. Beware of 'Evil Orville'. He materialises from the screen centre and proceeds to head straight for you, and your blaster doesn't worry Orville one bit. Escape is possible through one of the exits, but there is also the temptation to hang around and try to finish off those last couple of robots . . .

Frenzy, at £4.95 is an enjoyable game experience and has some smashing sound effects which add greatly to its appeal. It's a game that rewards repeated play, giving you a real chance of building up your ability. The screen layout, even after several hours play, never seems to repeat itself and so you have an infinite number of rooms to explore.

Pity about that score table though . . .

Sheepwalk
Virgin Games
Jim Lock

Give your laser finger a rest, take time out from defending the Galaxy against marauding meanies, and try your hand instead at this interesting and original game which simulates a sheepdog trial.

You control a sheepdog which tries to round up nine sheep. If left for too long to their own devices, the sheep will eat the corn, carrots and other crops growing in the field. Your dog too can damage the crops by trampling them underfoot whilst attempting to drive the sheep away. Additional hazards to negotiate are two haystacks in the centre of the field and a river which takes up a large part of the left hand side of the field. Your sheep, of course, cannot swim!



When all the surviving sheep have been penned, your score is given and points deducted for drowned sheep and crop damage. The time taken is also displayed and points taken off for that, too. It is possible to end with a minus score, as I did on my first attempt, despite successfully penning five of the sheep.

Scores do, of course, improve with practice, and with the discovery that the dog can swim across the river.

It really is an advantage to have watched "One man and his dog" before you play, as the game is very realistic – the sheep move in an infuriatingly lifelike manner – they will sneak out of the pen while the dog is occupied elsewhere, and stampede if the dog gets too close, particularly the last two sheep.

The game has attractive graphics and runs in Basic at a gentle pace. It is easy to master the essentials of the game but difficult to get a high score.

The presentation of the cassette is, however, disappointing. The loading instructions are well hidden (on the cassette label), and the program is only recorded on one side of the tape. The other side is taken up with a boring bit of music.

I would unhesitatingly recommend Sheepwalk to all armchair shepherds, if it were not for the price. £7.95 is too much for this game, enjoyable

and original as it is. How about a price reduction, Virgin Games, say to around £5.50?

Pssst
Ultimate
Jason Pick

Gardening is a hobby that I have always looked upon as being quiet and relaxing, and although the theme of this game is garden flavoured, no-one could describe it as quiet or relaxing.

While the fairly lengthy programme is loading, up comes a rather nice interesting picture to hold your attention, the quality of which made me very hopeful of things to come, and I certainly wasn't disappointed.

After selecting joystick or keyboard, one or two player options, you find yourself in control of Robbie the robot, who



you can move rapidly in eight directions all over the large playing area. From the bottom centre of the screen starts growing your prize flower with the wonderful name, Thrygodian Megga Chrisanthodil.

There is a garden wall on each side of the screen in which there are many recesses, and in these appear randomly the various sprays and items such as grow-bags, watering cans, etc., for bonus points.

Play commences with an invasion of Interstellar Space Slugs, who wiggle their way slightly diagonally up and down the screen, so that no matter what height they start at, if left undestroyed, they will all finish at the prize flower, which starts to shrink back down when more than one slug settles on it. They must be destroyed by guiding Robbie to the appropriate spray (the wrong one only stuns them temporarily) making sure Robbie doesn't come into contact with them, or he loses one of his five lives. He clicks very neatly on to the spray can if lined up O.K. and then can fire left or right with nice squeaky, puffy sounds. If you can manage to keep the flower pest-free for about four minutes, regardless of score, you will be rewarded with a nice tune and some nice graphics as the flower blooms in all its glory!

But that is the easy part; after each blooming you pass on to the next stage. The Slugs are now joined by Scuttling Leeches, and they sure can scuttle, moving at 45 degrees up and down they are very hard to avoid and hit, and of course the slug spray won't kill the leeches, so you are constantly changing sprays.

Again, if you can keep your flower clear for three to five minutes, another blooming will take place, and you can pass on to the thrid stage where the attack is mounted by the leeches and Menacing Midges, which have a fluttering, unpredictable kind of movement, and needless to say, require yet another type of spray.

Skill will once again bring a more difficult stage, where you are presented with all three kinds of bug at the same time, and changing cans while avoiding pets is quite a challenge.

Throughout the game, you are randomly presented with the chance of many bonus points by picking up fly-swots, fertilizer, etc., but this means dropping the spray can and leaving the plant and Robbie undefended. Fortunately you can ignore them until your skill reaches a high enough level and you start to worry about highest scores.

If you get through five stages, the music becomes more interesting and you may well face even more horrors, but that is for you to find out, because I'm afraid that is as far as I have got, and pretty exhausting it was too. I achieved a high score of twenty odd thousand but that seems almost secondary to the enjoyment that this game gives.

The number of graphics and their speed (the spray even expands three times as it moves across the screen) surely must mean the game is written in machine code.

In conclusion, this is the best game that I have tried, extremely well written, very entertaining and addictive and I thoroughly recommend it. The only fault I can find, is that if you have to use the keyboard to play instead of a joystick, you may find the keys used are a bit close together as they are all in a line next to each other on the left hand side of the keyboard, and I think would have been better with the right hand on the right side of the keyboard.

But in the face of such genius it's rather a petty complaint. The cassette fly is attractive and well documented, and for £5.35 completes a very worthwhile addition to anyone's games library.

Forth
Artic
Lindsay Godfrey

Among the latest software to receive Sinclair's stamp of approval is Artic's FORTH, for the 16K ZX81 or the 48K Spectrum, of which I have the ZX81 version.

FORTH is another computer language, which is ten times faster than BASIC and four times more compact. What makes it really powerful is the ability to make up your own functions called 'words'. Each word has a name (by which you refer to it) and a definition (what it does). Each new word is entered into the FORTH dictionary. Once a word has been entered, every time you type in the name of the word, its defintion is carried out. You could now define another word which contains the previous word you have just entered into the FORTH dictionary or/and any other word in the dictionary; so, after hours of programming, your brilliant program will be the definition of just one word.

The whole FORTH package is nicely presented and comes in a double sized cassette case along with a FORTH Users Manual, a FORTH Editors' Manual and a keyboard overlay. When the main program has LOADed it autoRUNs and greets you with:

'ZX81 FORTH,ARTIC COMPUTING,7294 BYTES FREE.'

and waits for your input. The program does not use single key entry like the ZX81's BASIC, and as far as numbers go you can use any base from 2 to 36.



Inside the FORTH dictionary there are already over 100 word definitions. To enter a new word into the dictionary you use for example;

: used to begin a definition
PRINT the example name of the new word
.'FORTH' the FORTH words defining what to do
; used to end a definition

If the above were entered every time you enter the name of the word ie.PRINT ,'FORTH' would be printed at the top right of the screen. '.' is the FORTH word for PRINT.

At any time the contents of the dictionary can be listed using VLIST, and any words you no longer want can be erased using;

FORGET (name of word)

and to clear all the words you have written from the dictionary you can enter;

COLD

If the worst comes to the worst and you get fed up with FORTH you can enter;

BYE

and say bye, bye to FORTH as it returns you to BASIC.

The unusual thing about FORTH is that in BASIC to add two numbers together and display them you would type;

PRINT 4 + 2

but in FORTH you would type;

4 2 + .

which means place 4 on the stack, place 2 on the stack, add them together placing the result on the stack, and finally, print the result.

You can not do any real programming until you LOAD the EDITOR. The Editor comes after the main program in four separate parts or 'screens'. Each screen is 1K long and has a number from 0 to 32768 but only one screen can be in memory at any one time. This may seem a problem but FORTH comes complete with a fast tape routine and it only takes 30 seconds to LOAD or SAVE a screen, or rather FLUSH, which is the FORTH word for SAVE.

As a screen is LOADed all the word definitions from that screen are put into the FORTH dictionary, and then the next screen can be LOADed. Each screen is organised as 16 lines, numbered from 0 to 15, of 64 characters. This is a method of ▶

storing memory and does not affect how you see the T.V. screen.

The Editor gives you various commands to manipulate the screens using the line numbers, a few of these commands are;

(n stands for a number)
Clear screen n
Put the following text into line n
Delete line n
Insert the following text into line n
List the current screen

To get the characters shown on the keyboard overlay and in the manuals you need a Q.S. character board, this can be confusing at times, when you are looking for a character that is not there, but is no real problem.

However, the fact that FORTH is so easy to crash is a problem. You only have to type in any graphics character or the wrong word and it crashes, 'bye bye FORTH!' Another small fault is that the keyboard overlay is not all that good!

Apart from the above, the FORTH package is very good, and anybody who wants to learn another language should get it.

FORTH costs £14.95 and is available direct from Sinclair.



Sabotage
Sinclair
James Rendell

Sabotage for the ZX81 gives you your big chance to live out that 007 type dream of becoming a saboteur. After loading the program, which takes three minutes, a well prepared opening page urges you to choose which destructive role you wish to take.

There are two variations of the game and in both games the screen represents a compound in which the boxes are placed. In game 1 you play the guard and must defend the randomly placed ammunition boxes. At the start of the game the saboteur, played by the computer, spends a few seconds working out where the best place to put a charge is: i.e. where the most boxes will be destroyed. The explosions spread as a chain reaction if adjacent boxes explode. When the computer has decided where to go you have twenty free moves with which you must race to intercept the saboteur. Your only defence in this (somewhat one-sided) battle is a truncheon which swings through a 5 x 5 area with you in the middle. If you can corner the guard or prevent him reaching his prime target you get extra points, but you lose them if you are caught in the blast (thank goodness it's only a game!).

Game 2 will appeal to those of us with a destructive mind. Here you play the saboteur and have to blow up as many of the two hundred boxes as you can (up to a maximum of fifty). You are encouraged to try and catch the guard in the blast; after all, there are eight hundred points to be gained for this sociable achievement. Once you have laid your charge you have ten seconds to run for it otherwise the saboteur's life expectancy is drastically reduced. If at any time during your destructive mission an unbroken vertical or horizontal path develops between you and the guard he will shoot with his rifle, and beware, he's a crack shot. You have ten charges to play with but the game ends if the guard shoots you.

Overall these are entertaining strategy games. The graphics are quite smooth since the bulk of the program is in machine code. However, the instructions are written in a rather informal manner and certain parts of the game are learnt by experience rather than by instruction.

Sabotage is £4.95 and is one of the latest Sinclair releases.



Espionage Island
Artic Computing
Michael Harris

Espionage Island is a large adventure game with over 50 locations to be discovered, and 12 or so objects to collect on the way, to be used for various purposes. It features a SAVE routine so that you can stop the game where and when you like, come back to it another time and carry on where you left off.

The basic plot is to leave your stricken aircraft (safely, and in one piece of course) explore an island, get into a military installation, collect its secret, escape, and return to your aircraft carrier. As there are a large number of locations, it really is essential that you draw a map as you go along. To move from one location to another you must type the direction required into the computer: it is not necessary to type out 'north', 'south', 'up' etc in as complete words — 'n', 's', 'u' will do just as well.

Anything that you come across on the way, collect. The computer understands simple commands, usually a verb and noun, like 'get torch', the reply being 'OK'. If the object is something to wear, then you must first 'get whatever' and then 'wear whatever'. To get you started, this is what you must do with a parachute in the plane at the beginning. If you do not then the reply will be '. . . pulling you out with a rush of air. You land, making a large red mess. You are dead. Do you wish to try again?', and back to the beginning you go. As you get further into the game, this can be extremely annoying, so it is a good idea to SAVE the game every so often, so you only have to go back so far. This is done by typing 'quit', and when asked if you wish to SAVE the game, say 'y' (it is not necessary to say 'yes') and use a blank cassette. However, if you say 'n' to the request, then the computer is wiped clear, and you have to reload the entire game. A request for 'help' (and you do have to spell this word out) more often than not tells you to 'try drawing a map', but occasionally will give you something useful — for instance 'help' will tell you 'no smoking'. One thing that is not clearly explained is that if you type in 'r' it will give a recap of your location description, which can be very useful if you have typed in all sorts, got nowhere and the original description has scrolled off the screen.

One location that had me confused was 'you are in a STICHED swamp, tell me what to do'. 'STICHED' is a misspelling of 'STITCHED' and if you think of a synonym for that, it will tell you which direction to go through the 'sinking swamp' to get out on the other side. If you do not get out you will eventually 'sink up to your neck and drown. Do you wish to try again?'. Without giving anything away, there is a point where you have to join a rope to two objects. If you type 'tie rope' it will reply 'what to?'. If you type in 'A and B' it will reply again 'what to?'. If you then retype it as 'to A and B', or even 'to A and to B' then the computer will accept this but only understand the first part of it (i.e. 'to A'). The correct way appears to be 'tie rope', 'what to?', 'to A', 'OK'; 'tie rope', 'what to?', 'to B'. This will give the right answer 'I can see a rope tied to A and to B'.

If you really get stuck with this game, then a request to Artic Computing will bring a Tip sheet to help. I expect they would appreciate an SAE.

Espionage Island kept me occupied for several evenings and Artic are to be congratulated on producing such an interesting game. I can't wait to get into the other three adventure games they produce. Espionage Island requires a 48K Spectrum and costs £6.95.

For further information on the cassettes reviewed in this article, you can write to the following addresses:

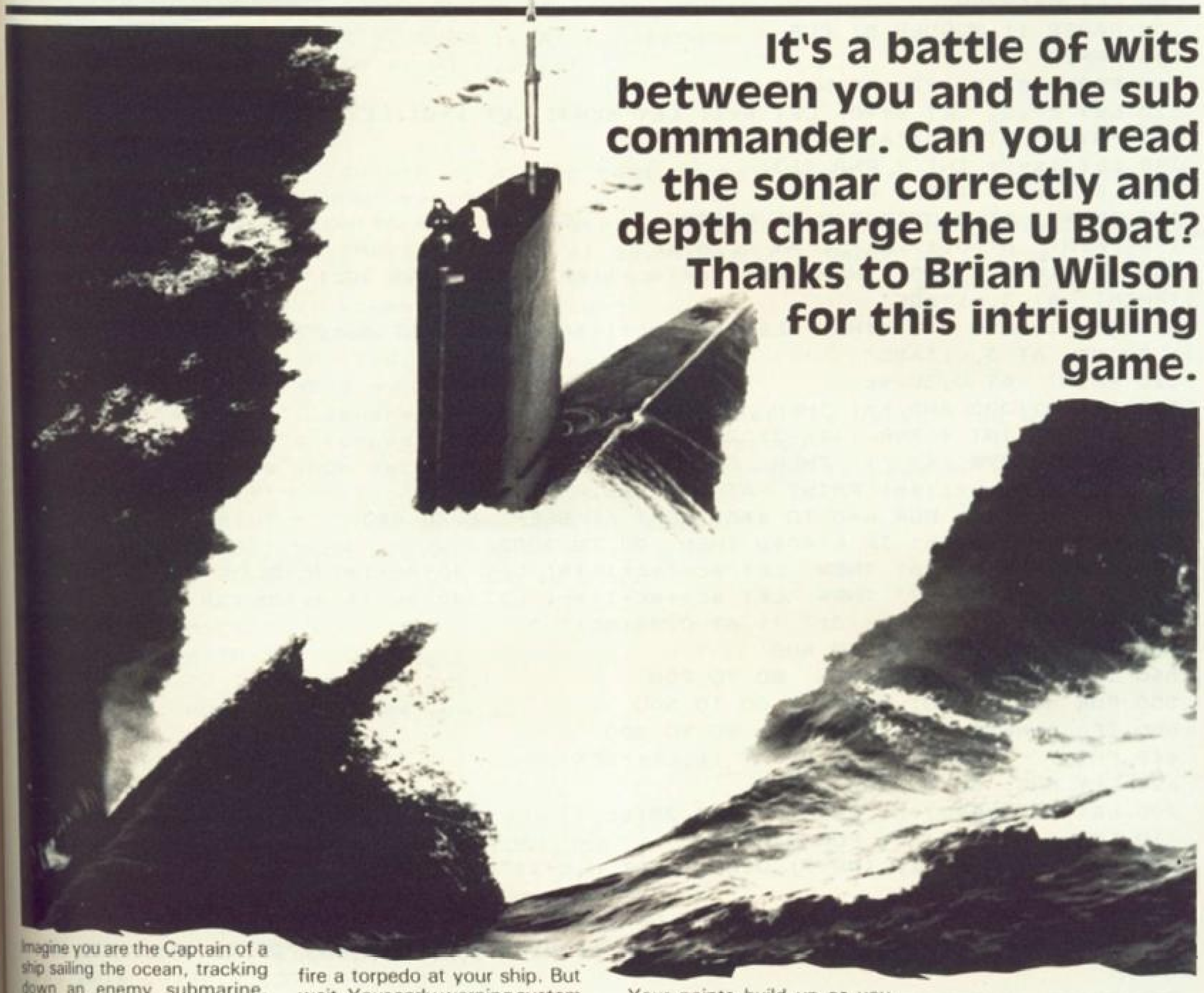
Intelligent Software, 21 Store Street, London WC1E 7DH
Quicksilva, Palmerston Park House, 13 Palmerston Road, Southampton SO1 1LL
Virgin Games, 61-63 Portobello Road, London W11
Ultimate, The Green, Ashby de la Zouch, Leicestershire LE6 5JU
Artic Computing, Main Street, Brandesburton, Driffield YO25 8RG
Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS

The authors of any of the reviews published within this section of the magazine will receive payment equal to the amount spent on the software reviewed unless another financial arrangement has already been settled on. All contributions should be typed, double spaced, and be accompanied with screen dumps where possible. Your reviews should be sent to the following address:

Readers' Reviews,
ZX Computing,
1 Golden Square,
London W1R 3AB

Depth charge

It's a battle of wits between you and the sub commander. Can you read the sonar correctly and depth charge the U Boat? Thanks to Brian Wilson for this intriguing game.



Imagine you are the Captain of a ship sailing the ocean, tracking down an enemy submarine. Your task is to hunt and destroy the sub, which is not easy, considering that you can't see it! Help at least is at hand in the form of sonar — the delay and pitch of the returning echo is all the information you have, though. And armed with this information you must determine where you think the submarine is, set the depth charge and launch it.

Attention all shipping!

Now you didn't exactly expect that the submarine commander would just sit there and wait for you to get him, did you? And believe me, he doesn't! He will fire a torpedo at your ship. But wait. Your early warning system will give you an audible warning — can you evade the deadly weapon?

The details

In order to save over-elaborate instructions in the program, a training facility is built-in and if you press 0 at the start, the submarine will appear, without being armed with torpedos and you cannot score. You need only press any other key to get going. Press 1 for sonar, press 2 to release the depth charge, keys 5 and 8 move your ship and keys 6 and 7 control the depth of charge. If at any time you should get stuck, just press 9 again to make the submarine appear.

Your points build up as you press a key and the aim is to get the lowest number of points. Happy hunting!

Lines	Action
40- 170	Initialising and screen build up.
300- 320	Moves ship.
350	Gives help if you go over 100.
400-430	Sonar.
450	Initiate torpedo warning.
500- 550	Set depth charge and launch.
610- 620	Prints submarine (help).
700- 730	Charge descends.
740- 820	Submarine destroyed.
830- 895	Score diplay.
900- 930	Charge exploding.
1000-1130	Instructions.
2000-2086	Graphics.
3000-3090	Torpedo warning and ship sinking.

STOP! Before typing in this program, please see the Editor's note in the Welcome section.

```
 10 PRINT  AT 0,11;"SUBMARINE"
 15 PLOT 88,167: DRAW 72,0
 20 PRINT  AT 10,6;"Please wait a moment."
 25 GO SUB 2000: REM graphics
 30 GO SUB 1000: REM instructions
 40 LET bs=9999
100 PAPER 1: BORDER 5: CLS
105 PAPER 7
110 FOR n=0 TO 127: PRINT " ";: NEXT n
120 LET c=15: LET sc=0: LET h=1: LET dc=3: LET k=0: LET k1=0: LET q=1
130 PRINT  AT 3,c;"ABC"
140 LET ls=7+ INT ( RND *13)
150 LET cs=1+ INT ( RND *28)
160 PRINT  AT 0,0;"DEPTH OF CHARGE       SCORE"
170 PRINT  AT 0,17;dc-3; AT 0,28;sc
300 IF  INKEY$ ="5" THEN  LET sc=(sc+1)*h: PRINT  AT 3,c;"   ": LET c=c-1*(c>0)
: PRINT  AT 3,c;"ABC"
310 IF  INKEY$ ="8" THEN  LET sc=(sc+1)*h: PRINT  AT 3,c;"   ": LET c=c+1*(c<29
): PRINT  AT 3,c;"ABC"
320 PRINT  AT 0,28;sc
350 IF sc>1000 AND h=1 THEN  GO TO 610
400 LET d= INT ( SQR ((ls-3)^2+( ABS (cs-c))^2))
410 IF  INKEY$  <> "1" THEN  GO TO 450
420 LET sc=(sc+1)*h: PRINT  AT 0,28;sc
430 BEEP .1,40: FOR n=0 TO d*5: NEXT n: BEEP .1,70-d*3
450 LET k=(k+1)*h: IF k>40*q THEN  GO TO 3000
500 IF  INKEY$ ="6" THEN  LET sc=(sc+1)*h: LET dc=dc+1*(dc<21)
510 IF  INKEY$ ="7" THEN  LET sc=(sc+1)*h: LET dc=dc-1*(dc>5)
520 PRINT  AT 0,17;dc-3;" "; AT 0,28;sc;" "
530 IF dc=3 THEN  GO TO 600
540 IF  INKEY$ ="2" THEN  GO TO 700
550 FOR n=0 TO 20: NEXT n: GO TO 500
600 IF  INKEY$  <> "0" THEN  GO TO 300
610 PRINT  PAPER 1; INK 7; AT ls,cs;"DEF"
620 LET h=0: GO TO 300
700 LET sc=(sc+2)*h: PRINT  AT 0,28;sc
710 FOR n=4 TO dc-1: FOR m=0 TO 1
720 PRINT  PAPER 1; INK 7; OVER 1; AT n,c+1;"G": BEEP .3,1
730 NEXT m: NEXT n
740 IF n>ls+1 OR n<ls-1 OR c>cs+2 OR c+2<cs THEN  GO TO 900
745 FOR n=0 TO 5: PRINT  PAPER 1; INK 6; OVER 1; AT ls,cs;"DEF": BEEP .05,20: N
EXT n
750 PRINT  PAPER 1; AT ls,cs;"   "
760 FOR n=0 TO 9: PRINT  PAPER 1; INK 6; OVER 1; AT ls,cs;"HJH"
770 BEEP .05,20: NEXT n: PRINT  PAPER 1; AT ls,cs;"   "
780 FOR x=ls TO 21: FOR n=0 TO 3
790 PRINT  PAPER 1; INK 7; OVER 1; AT x,cs-1;"IKHKL"
800 IF x+1 <= 21 THEN  PRINT  PAPER 1; INK 7; OVER 1; AT x+1,cs-1;"KHJHI"
810 IF x+2 <= 21 THEN  PRINT  PAPER 1; INK 7; OVER 1; AT x+2,cs-1;"MKIKN"
820 BEEP .05,40-x*4: NEXT n: NEXT x
830 PAUSE 100: CLS : IF sc<bs*h THEN  LET bs=sc
835 PLOT 56,151: DRAW 152,0
840 PRINT  AT 2,7;"SUBMARINE DESTROYED"; AT 6,4;"Score:",sc
845 PRINT  AT 10,4;"Best Score:",bs
850 IF sc=0 THEN  LET a$="You had help no score.": GO TO 870
860 IF sc<30 THEN  LET a$="Join      the      Navy.": GO TO 870
861 IF sc<60 THEN  LET a$="     Excellent.": GO TO 870
862 IF sc<100 THEN  LET a$="       Well Done.": GO TO 870
```

```
863 LET a$="      Try Harder."
870 PRINT  AT 14,4;a$
880 PRINT  AT 18,1;"Press any key for another game."
890 PAUSE 0: FOR n=0 TO 10: BEEP  RND ,30- RND *40
895 NEXT n: GO TO 100
900 LET dc=3: FOR m=0 TO 7: BEEP .05,-10
910 PRINT  PAPER 1; INK 6; OVER 1; AT n,c+1;"H"
920 NEXT m: PRINT  PAPER 1; AT n,c+1;" "
930 GO TO 300
1000 REM instructions
1010 PRINT  AT 10,6;"                     "
1020 PRINT  AT 2,0;"  You are on a ship that is to"'"hunt and destroy an enemy"'
"submarine that you cannot see."
1030 PRINT  AT 6,11;"CONTROLS"; AT 8,10;"1","Sonar."; AT 10,10;"2","Releases Cha
rge."; AT 12,8;"5 & 8","Moves Ship."; AT 14,8;"6 & 7","Depth of Charge."
1040 PRINT  AT 16,0;"  To start with, and if you get"'"stuck press 0 and the sub
marine"'"will appear.  Lowest score wins."
1050 PRINT  AT 20,9;"Press any key."
1060 PAUSE 0: PRINT  AT 2,0;" ";: FOR n=1 TO 136
1070 PRINT "     ";: NEXT n
1080 PRINT  AT 3,0;"  Beware the submarine can "'"strike back.  You will get a"'
"warning sound when a torpedo"'"is comming towards you."''
1090 PRINT "  It is your decision whether to"'"attempt to move or not.  It is"'"
a matter of luck."''''
1100 PAUSE 0: PRINT "  This is the warning sound."
1110 FOR n=0 TO 50: BEEP .05,50: NEXT n
1120 PRINT  AT 20,22;" "; AT 21,12;"to play."
1130 PAUSE 0: RETURN
2000 REM graphics
2010 FOR q=144 TO 157
2020 FOR n=0 TO 7
2030 READ a: POKE  USR  CHR$ q+n,a
2040 NEXT n: NEXT q
2045 RESTORE : RETURN
2050 DATA 0,0,0,1,1,255,255,127
2051 DATA 0,24,24,217,255,255,255,255
2052 DATA 128,128,128,240,240,255,254,252
2060 DATA 0,0,0,0,127,255,255,127
2061 DATA 128,240,240,240,255,255,255,255
2062 DATA 0,0,0,0,249,255,255,249
2070 DATA 0,0,126,126,126,126,0,0
2080 DATA 20,82,72,32,148,1,82,84
2081 DATA 5,0,40,0,21,64,37,136
2082 DATA 9,64,36,64,32,4,32,132
2083 DATA 0,40,2,72,18,64,10,64
2084 DATA 64,16,64,8,130,40,68,34
2085 DATA 5,64,16,4,0,18,0,2
2086 DATA 85,0,84,0,136,32,20,160
3000 IF k1<4 THEN  BEEP .05,50: LET k1=k1+1: GO TO 600
3010 LET q=.5+( RND /2): LET k=0: LET k1=0
3020 LET ct=c-3+ INT ( RND *8+.5)
3030 IF c=ct OR c+1=ct OR c+2=ct THEN  GO TO 3050
3040 GO TO 600
3050 PRINT  AT 3,c;"   ": FOR n=4 TO 21: FOR m=0 TO 1
3060 PRINT  PAPER 1; INK 5; OVER 1; AT n,c;"ABC"
3070 BEEP .1,20-n*2: NEXT m: NEXT n
3080 LET sc=sc+20: LET a= INT ( RND +.5)
3090 LET c=29*a: PRINT  AT 3,c;"ABC": GO TO 300
```

The 1K corral

A galaxy of great programs rounded up for your 1K ZX81.

Although sometimes frustrating to work within the limited confines of 1K memory, you may find it worthwhile to study how programmers have managed to use the memory space — something you may (and should) find useful even working within 16K or 48K.

If you would like to contribute material to this feature, please try to explain the techniques you have employed to get your program into 1K. And now, get typing and have fun.

Minefield
Damian Swift

This is one of the best 1K games I've seen and is quite difficult to beat. You are in command of a mini-submarine which is speeding through enemy minefields. The mines are represented by "*" and your sub is the inverse ">". Using keys 6 and 7 to move up and down, you must avoid the mines while staying between the surface (minus signs) and the sea bed (grey squares — graphic A's) Take care!




```
 5 FOR F=SGN PI TO INT PI
10 CLS
15 FAST
20 PRINT "--------------------
-----------";AT VAL "8",NOT PI,
"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒"
```

```
25 FOR M=NOT PI TO CODE "2"
30 PRINT AT VAL "6"*RND+SGN PI
,RND*CODE "?"+CODE "▌";"*"
35 NEXT M
40 SLOW
45 LET D=INT (VAL "6"*RND+SGN
PI)
50 FOR S=NOT PI TO CODE ";"
55 PRINT AT D,S;
60 IF PEEK (PEEK 16398+PEEK 16
399*256)=CODE "*" THEN PRINT "▘▞
";TAB NOT PI;"DESROYED IN FIELD
";F;AT D,S;" ";E
65 PRINT "▒"
70 LET A=D
75 LET D=D+(INKEY$="6" AND D<V
AL "7")-(INKEY$="7" AND D>SGN PI
)
80 PRINT AT A,S;" "
85 NEXT S
90 NEXT F
95 PRINT "YOU GOT THROUGH"
```



Smugglers
Damian Swift

Another challenging game from the 1K master. In this one you are a smuggler trying to load your orbiting spaceship with uranium. The spaceship is at the top of the screen and is moving from left to right. The supply shop which is under your control starts at the bottom, on the ground. Using keys 6 and 7 to move up and down, you must fly up and dock with the tail end of the spaceship as it passes. An inverse 0 in the centre of your shuttle denotes a full load.

Just one small problem, there is also an anti-smuggler orbiting defence satellite which will destroy if you are either directly ahead or above it with a full load. Who said 1K games were easy!!!!

```
 5 LET S=NOT PI
10 LET A=S
15 LET M=S
20 LET H=VAL "9"
25 LET A$= "▄▄▄"
30 PRINT AT PI,CODE "-";"    ";
AT NOT PI,CODE "*";"    ";AT H-5
```

```
GN PI,CODE "■";"   ";AT H+SGN PI
,CODE "■";"   ";AT CODE "■",NOT
PI;"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";AT
PI,A;"   ■■";AT NOT PI,H;"   ■■■";
AT H,CODE "■";A$
  35 IF NOT H AND M<=VAL "9" AND
 M>=VAL "5" THEN PRINT AT NOT PI
,M;"■■■■";AT PI,NOT PI;"CRASHED.
 SCORE=";S;E
  40 IF (H=INT PI AND A<CODE "■"
) OR (ABS (VAL "8"-A)<=SGN PI AN
D A$="■■■" AND H<PI) THEN PRINT
AT H,CODE "■";"■■■■■ SCORE=";S;E
  45 IF NOT H AND M=CODE "■" AND
 A$="■■■" THEN GOSUB CODE "■"
  50 LET H=ABS H+(INKEY$="6" AND
 H<CODE "■")-(INKEY$="7")
  55 IF H=VAL "9" THEN LET A$="■
■■"
  60 LET M=M+SGN PI AND M<=CODE
"="
  65 LET A=A+PI/CODE "■" AND A<=
CODE "="
  70 GOTO CODE "2"
 150 PRINT AT H,M;"■■■"
 155 LET A$="■■■"
 160 LET S=S+SGN PI
 165 RETURN
```

Emergency
J Symons

How good are your reactions? This is a variation on the reaction timer programs but with some clever techniques and a good graphic display.

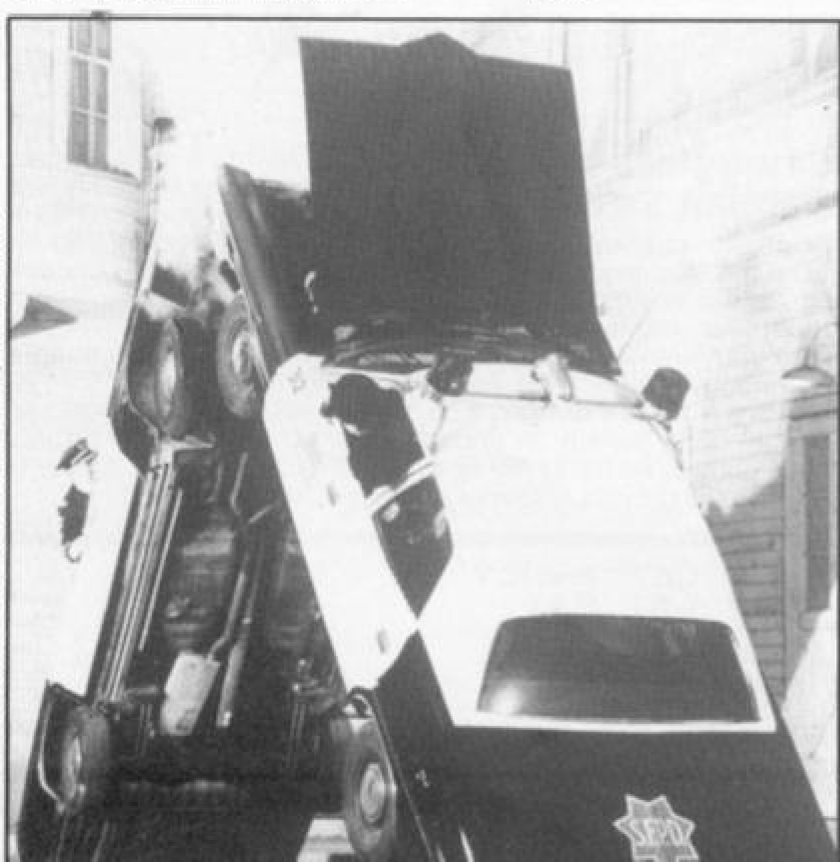
Mr Symons says that he developed this program for use in his school after one of his colleagues showed disdain for the "cheap toy" and spent hours on the expensive school computer, only to produce a much inferior program.

The program asks you to press key Z when the car appears and then displays your time. Mr Symons suggests that players start with their fingers on the table in order to get a more accurate response and eliminate cheating!

The use of this program in a school promoted much discussion and enhanced his lessons considerably.

Ed's tip: Why not condense lines 90 to 120 into one long line of PRINTing using: TAB, this should speed up the drawing of the car.

VARIABLES
- F — Pause interval.
- K — Counter for 5 repeats.
- J — Timing loop.
- T — Current time.
- T$ — String time, allows times to be shortened to 5 digits.
- B — Best time.
- P — Horizontal print position.



Photograph courtesy of Walt Disney Productions

```
  10 PRINT AT CODE "■",CODE "■";
"EMERGENCY  STOP "
  20 PRINT AT CODE "■",CODE "■";
"WHEN YOU SEE A CAR AHEAD"," PRE
SS *Z* TO STOP "
  25 LET F=300
  30 PAUSE F
  40 CLS
  50 LET B=CODE "■"
  60 LET T=PI-PI
  70 LET K=PI/PI
  75 IF INKEY$<>"" THEN GOTO F/C
ODE "■"
  80 PAUSE RND*F
  85 LET P=CODE "■"
  90 PRINT AT CODE "■",P;"   ■■■
"
 100 PRINT AT VAL "11",P;" ■■■■■■
■"
 110 PRINT AT VAL "12",P;"■■■■■■■
■■■■"
 120 PRINT AT VAL "13",P;" ■
■"
 130 FOR J=CODE "■" TO CODE "O"
 140 IF INKEY$="Z" THEN GOTO F
 150 IF J=CODE "O" THEN PRINT AT
 VAL "15",CODE "■";"QUICK YOU CRA
SHED"
 160 NEXT J
 300 LET T$=STR$ (J/25.6)
 305 LET T=VAL (T$( TO 5))
 310 IF T<B THEN LET B=T
 315 PRINT
 320 PRINT "TIME=";T;" SECONDS",
"BEST=";B
 325 PRINT
 330 PRINT "YOU TRAVEL ";T*20;"
METRES"
 335 PAUSE F
 340 LET K=K+1
 345 CLS
 350 IF K=CODE "■" THEN GOTO COD
E "■"
 360 GOTO VAL "75"
```

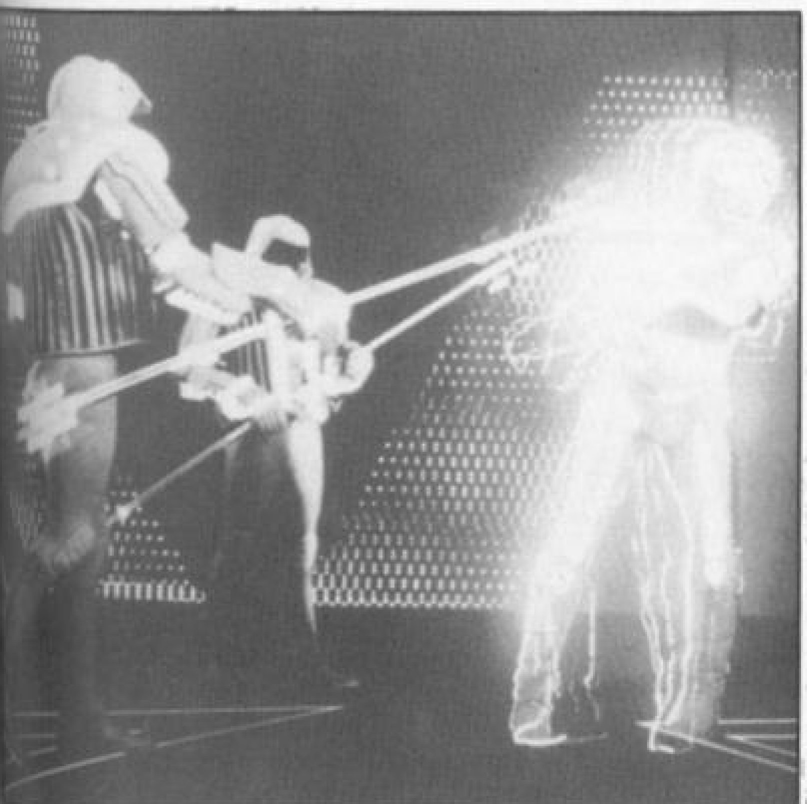
Rubbish!
Simon Rutherford

Of course I don't mean the quality of this program! In fact this is a rare item: a two player game which involves gathering cosmic garbage by driving your space bulldozer into it!

Each player takes five turns and are known as player V and player +. Full instructions are included — unusual in 1K — and if you experience any problems when the program is RN then try removing them if you get an error 4 report. Otherwise call in a friend and fight it out, in a gentle way, of course.

```
   1 PRINT "    CHAMPION GARBAGE GO
BBLERS"
   2 PRINT "INFO; V USES: 5=LEFT
,8=RIGHT"
   3 PRINT "        + USES: N=LEFT
,M=RIGHT"
   4 PRINT "YOU EACH CLEAR AS MU
CH GARBAGE  AS YOU CAN BY CRASHI
NG INTO IT."
   5 PRINT "INVERSE GARBAGE WORT
H 0 BEACAUSE ITS BEEN HIT BY SOL
AR RADIATION"
   6 PRINT "*GET READY, THEN HIT
 ANY KEY*"
   7 IF INKEY$="" THEN GOTO 7
   8 CLS
   9 REM GARBAGE
  10 LET X=10
  15 LET V=15
  20 LET Y=10
  25 LET W=10
  30 LET S=0
  35 LET R=0
  40 LET F=S
  45 LET T=R
```

```
 50 LET F=F+1
 55 LET T=T+1
 60 PRINT AT 20,INT (RND*20);CH
R$ (INT (RND*63+1)+(128 AND RND<
.2));AT Y,X;" ";AT W,V;" "
 80 LET V=V+(INKEY$="M" AND V<1
9)-(INKEY$="N" AND V>0)
 84 LET X=X+(INKEY$="8" AND X<1
9)-(INKEY$="5" AND X>0)
 85 SCROLL
 90 PRINT AT Y,X;"V";AT Y+1,X;
 95 LET P=PEEK (PEEK 16398+256*
PEEK 16399)
 100 PRINT AT W,V;"+";AT W+1,V;
 120 LET Q=PEEK (PEEK 16398+256*
PEEK 16399)
 130 IF P<64 THEN LET S=S+P
 140 IF Q<64 THEN LET R=R+Q
 150 IF F<100 THEN GOTO 50
 160 IF T<100 THEN GOTO 50
 170 PRINT AT 0,0;"SCORE V=";S
 180 PRINT AT 1,0;"SCORE +=";R
 190 IF S<R THEN PRINT AT 2,0;"█
+ IS WINNER +"
 200 IF S>R THEN PRINT AT 2,0;"█
V IS WINNER +"
 210 IF S=R THEN PRINT AT 2,0;"█
███DRAW█████"
```



Photograph courtesy of Walt Disney Productions

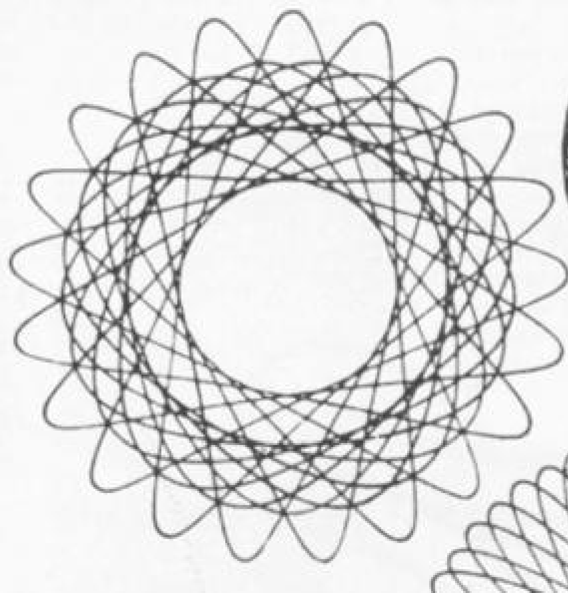
Laser defence
Rickaby and Crowley

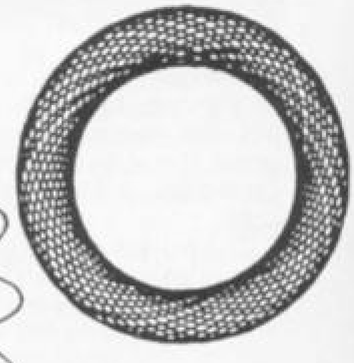
You are on a space station on the edge of the solar system waiting for the evil alien robots (X) to attack. Can you prevent them from getting past you and attacking Earth?

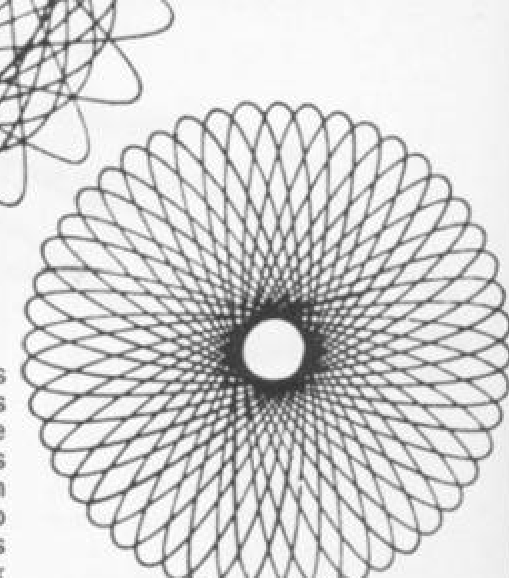
Move your gun up with key 7 and down with key 6, using key 8 to fire at them and key Q to drop a bomb. The aliens attack in waves of 20 ships and to survive until the next wave you will have to destroy at least 15 of them. After each attack, the amount of fuel that you have left will flash up on the screen.

May the force be with you.

```
10 LET A=0
20 LET J=200
30 LET K=10
40 LET G=0
50 LET X=INT (RND*18)+2
60 LET A=A+1
70 IF A=21 THEN GOTO 260
80 LET Y=30
90 PRINT AT K,0;CHR$ 130;CHR$
128;AT X,Y;"X"
100 IF J=0 THEN GOTO 150
110 IF INKEY$="7" THEN LET K=K
-1
120 IF INKEY$="6" THEN LET K=K
+1
130 IF INKEY$="8" THEN PRINT A
T K,2;"20 inverse spaces"
140 IF INKEY$="5" THEN LET J=J
-1
150 LET Y=Y-1.5
160 IF Y=3 THEN LET G=G+1
170 IF G=5 THEN GOTO 240
180 IF Y=3 THEN GOTO 50
190 IF INKEY$="8" AND K=X AND
Y<21 THEN GOTO 220
200 CLS
210 GOTO 90
220 PRINT AT X,Y+1;CHR$ 160
230 GOTO 50
240 PRINT "DESTROYED"
250 STOP
260 PRINT "YOU WIN"
270 PRINT "FUEL LEFT";J
280 RUN
```







Symmetry
Simon Mills

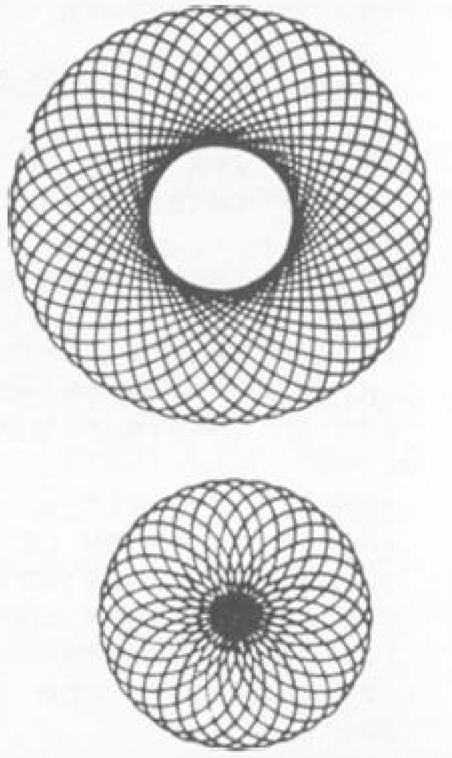
A program which despite its simplicity generates fabulous patterns. The secret is in the fact that the patterns it creates are symmetrical. The program will continue to add points to the pattern until you press break or any other key. Break will allow you to make a copy of the screen and pressing any other key will clear the screen and start again.

I have spent many minutes watching this program running

when I should have been editing!

Lines

20- 30	Generate random co-ordinates.
40-110	PLOT the pattern.
120-130	Clear screen if key pressed.



```
  1 LET C=40
 10 CLS
 20 LET A=RND*20
 30 LET B=RND*20
 40 PLOT A,B
 50 PLOT B,A
 60 PLOT C-A,C-B
 70 PLOT C-B,C-A
 80 PLOT A,C-B
 90 PLOT B,C-A
100 PLOT C-A,B
110 PLOT C-B,A
120 IF INKEY$="" THEN GOTO 20
130 RUN
```

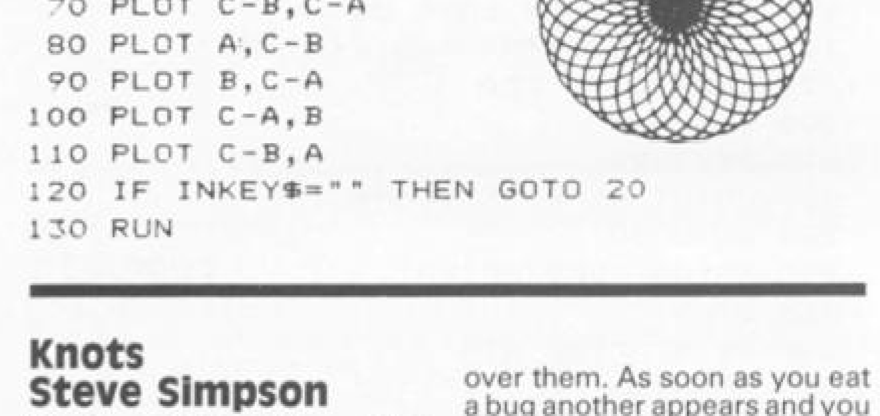
Knots
Steve Simpson

Clever programming using PEEK and POKE to the screen speeds up this program and makes it a must for the ol' corral.

The game itself is a variation of the old favourite "snake", but the screen display is as good, if not better, than many professional 1K games being sold.

The object of the game is to eat as many bugs (*) as possible by guiding your worm (0) over them. As soon as you eat a bug another appears and you must go and eat that one as well. Your worm, however, is very unusual because it leaves a trail behind it which you cannot cross, this means that the game becomes harder and harder, eventually putting you in a position which is impossible to get out of.

Use the cursor keys 5, 6, 7 and 8 to control your movement, and press R when you finally reach that impossible position.

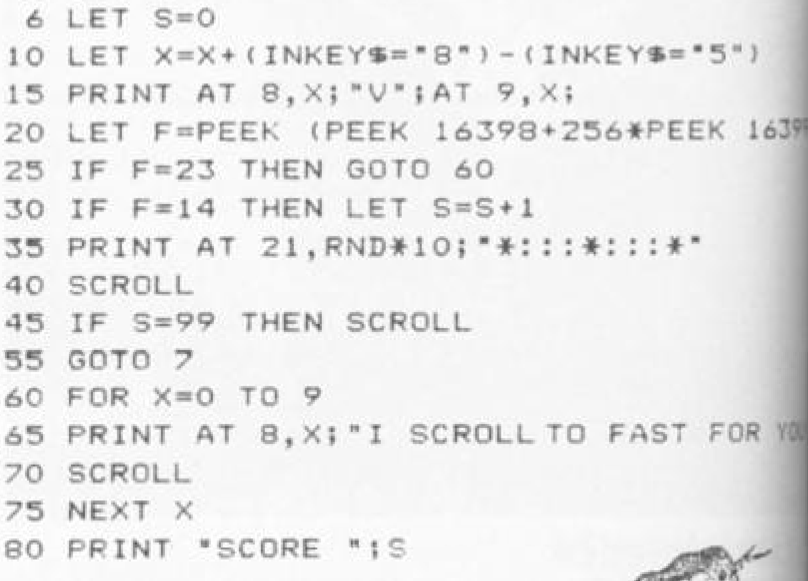


```
  5 CLS
  7 LET S=0
 10 FOR X=S TO 287
 20 PRINT "inverse space";
 30 NEXT X
 35 PRINT "SCORE ";S
 40 LET X=1+PEEK 16396+256*PEEK
16397
 50 LET J=X
 55 LET C=J+RND*297
 56 IF PEEK C<>128 THEN GOTO 55
 57 POKE C,151
 60 POKE X,156
 65 LET K=X
 70 LET X=X+(INKEY$="8")+33*(IN
KEY$="6")-(INKEY$="5")-33*(INKEY
$="7")
 75 IF INKEY$="R" THEN RUN
 80 IF PEEK X=151 THEN GOTO 200
 90 IF PEEK X<>128 THEN LET X=K
100 GOTO60
200 POKE X,156
210 LET S=S+1
220 PRINT AT 9,6;S
230 GOTO 55
```

Grass snake
I R Mathias

Another of the scrolling games but this one has an increasing difficulty level. The task is to guide your snake (V) left and right keeping on the grass (:), and avoiding the weeds (*). To do this use keys 5 and 8. Note that the words in line 65 "SCROLL TO FAST FOR" are all keywords which are obtained by entering "THEN", entering the keyword and using backspace and RUBOUT to remove the "THEN". This saves memory and also explains the unusual grammar. Hissssterical eh!

```
 5 LET X=9
 6 LET S=0
10 LET X=X+(INKEY$="8")-(INKEY$="5")
15 PRINT AT 8,X;"V";AT 9,X;
20 LET F=PEEK (PEEK 16398+256*PEEK 1639
25 IF F=23 THEN GOTO 60
30 IF F=14 THEN LET S=S+1
35 PRINT AT 21,RND*10;"*:::*:::*"
40 SCROLL
45 IF S=99 THEN SCROLL
55 GOTO 7
60 FOR X=0 TO 9
65 PRINT AT 8,X;"I SCROLL TO FAST FOR YO
70 SCROLL
75 NEXT X
80 PRINT "SCORE ";S
```



Club corner



ZX User Club

Dear ZX Computing,
As far as I know, there is no ZX User Club in Geneva. Could you ask your readers if anyone would be interested in founding such a club in Geneva.
Yours faithfully,

Rudolf Arnold,
10 Av. de Senarclens,
1293 Bellvue,
Geneva,
Switzerland.

Bits and Bytes

Dear ZX Computing,
I am starting a computer club which will be called 'Bits and Bytes'. If you join you will receive six magazines a year which will include ideas, programs, software offers and many more things. The cost would be £4.00 per year and you would receive one magazine every two months.

I am starting a club because I am interested in computers and would like to find out other peoples opinions on and about computers. Please will you publish this in ZX Computing. Thank you.
Yours faithfully,

T. Boyle,
If you would like more information, contact me by post at:

7 Beagle Ridge Drive,
Foxwood Lane,
Acomb,
York YO2 3JH.

Doncaster and District Sinclair Computer Club

Dear ZX Computing,
The Doncaster and District Sinclair Computer Club has been reformed from the original Doncaster and District Users Club.

I would be grateful if you would print the following notice in Club Corner:
The Doncaster and District Sinclair Computer Club holds meetings every Wednesday evening. For membership details please telephone: 0302 853124.
Yours faithfully,

A Cooper (Chairman),
60 Mill Lane,
Warmsworth,
Doncaster,
South Yorkshire DN4 9RH.

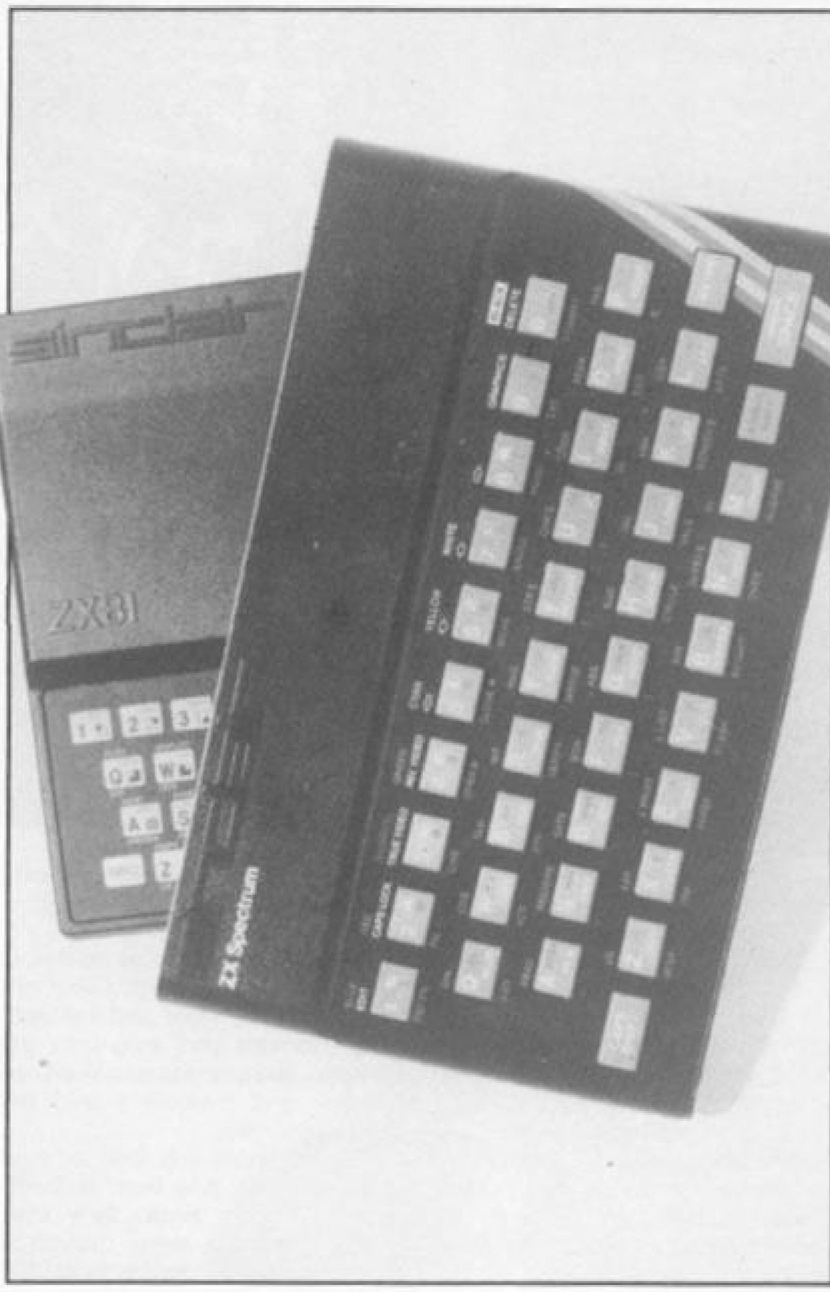
Universal ZX Club?

Dear ZX Computing,
Would you be so kind as to publish this letter. I would like to correspond with like minded enthusiasts via tapes and in this way exchange ideas, news and programs. If I get several replies we could start a Universal ZX Club through which members could learn more about their machines.

Anyone interested should write to me at the address below giving me their full address and each person would receive details of other members.

The only condition laid down would be that each member would circulate only their own programs and I must stress the fact that no membership fees will be involved.
Yours faithfully,

G J Coetzee,
796 Kuyper Street,
Reitfontein, 0084,
Pretoria,
South Africa.



The ZX Machine Code Users Club

The ZX Machine Code Users Club is the only machine-code-only club in existence for ZX81 and Spectrum users. If you're interested in machine code or want to know more about the club, please write, enclosing a stamped addressed envelope to:

Miss Toni Baker,
37 Stratford Road,
Wolverton,
Milton Keynes MK12 5LW.

If you run, or are a member of a user club which caters for the Sinclair user, why not get your group on the map by writing to us at:

Club Corner,
ZX Computing,
1 Golden Square,
London W1R 3AB

All you have to do is to send us a letter with details of your club's activities (times of meetings, addresses of who to contact etc.) and we'll do the rest. If you publish a newsletter or club magazine, we'd very much like to see that too.

And if you don't see a club in your area, why not start one up by writing to *ZX Computing* and seeing if any like-minded enthusiasts wish to join you.

Valley of death

Take charge of the Light Brigade in their famous last charge invites Jerome K Laskowski.



"Half a league, half a league,
Half a league onward,
All in the valley of Death . . .

"Cannon to right of them,
Cannon to left of them,
Cannon in front of them
Volley'd and thunder'd;
Storm'd at with shot and shell,
Boldly they rode and well,
Into the jaws of Death,
Into the mouth of Hell . . ."

– Tennyson (The Charge of the Light Brigade)

Stirring words; stirring words, indeed. It is the Battle of Balaklava: 25 October 1854, Crimean War. You are Brigadier-General Lord Cardigan, and are about to lead the ill-fated charge of the Light Brigade against the 30 Russian cannons in the Valley of Death below.

The display shows the hopelessness of your position – your small group of men poised ready to advance gallantly to almost certain death. The Russian guns, trained on your troops at every step, are lined up along all three sides of the valley – their ranges shown.

Input your order to advance: L for left and forward, O for onward, or R for right and forward. The moment you step into the valley, the cannons start to "volley and thunder", and the carnage begins.

Three shots are fired at you: one from left, one from in front, and one from right. Any man within range is slain, though if two are within range only the nearest is hit. Your score is reduced by the strength of any soldier shot down.

After the Enemy's three shots you may fire one shot back. Input it by giving the position of the firing soldier (A to I, as shown on the right of the battlefield) and the direction he is firing in (L, O, or R, as before). For example, your first shot might be AL, or HO, or IR.

Your score is increased by the strength of any cannon you put out of action. However,

```
        THE VALLEY OF DEATH



                144
           8.....259....6
           8.....853....2   THE LIGHT
           7............6    BRIGADE
           9............3
           4............2      ABC
           7............5      DEF
           3............2      GHI
           9............4
           4............5
           8............6
           1............5
             34489737951

                               WR=63

ADVANCE INTO VALLEY:   L,O, OR R
"L"
```

Fig.1. Initial screen display. The initial screen display (above) shows the small band of nine soldiers, representing the Light Brigade, about to charge against the 33 Russian guns in the valley below. The first move is signalled by inputting L, O, or R depending on whether the first step is to be Leftwards, Onwards, or Rightwards.

In the case shown above, going Rightwards would seem slightly less fatal than going Leftwards or Onwards.

beware of shooting thoughtlessly, for the direction of your shot (L, O, or R) also determines the direction of your next step forward. Thus if you shoot to the right, the Brigade will automatically advance to the right.

After you have shot and the Brigade advanced, the enemy again fires thrice at you, and so on.

On reaching the bottom of the valley, your advance automatically becomes a retreat. Your aim is to get as many of your men back out of the valley alive as you can. The strength of any that make it is added to your score. Getting even a single survivor out is no mean feat.

The Brigade moves as a unit and cannot pass through the sides of the valley. Even if a whole row or column is missing, the Brigade cannot approach a valley-side any nearer than it would if that row or column were still present.

Any score above zero at the end of the game is respectable, representing a moral victory. The current world record to aim for is an impressive 63 – the result of a memorably heroic charge.



```
        THE VALLEY OF DEATH



           8......144...6
           8......259...2   THE LIGHT
           7XXXXXX53...6     BRIGADE
FIRE 1     9............3
           4............2      ABC
           7............5      DEF
           3............2       HI
           9............4
           4............5
           8............6
           1............5
             34489737951

TOTAL -8                       WR=63

DIRECT HIT. LOSE 8
```

Fig.2. Cannon to left. After the first step into the valley, three cannons fire out at the Light Brigade – one from each side. The first, firing from left, has range 7 and strikes down the man at position G. Lose 8 points.

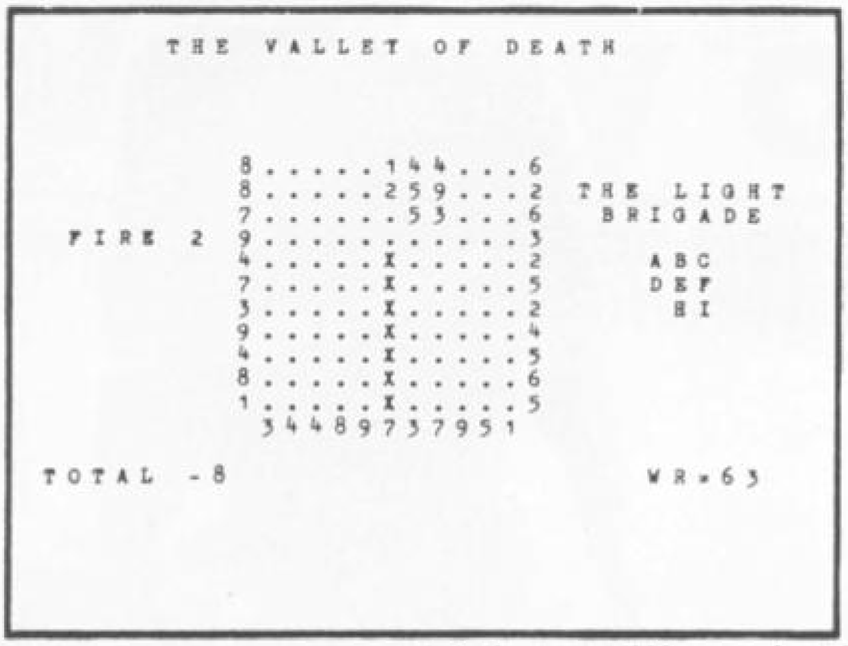


Fig.3. Cannon in front. The shot from in front falls short.

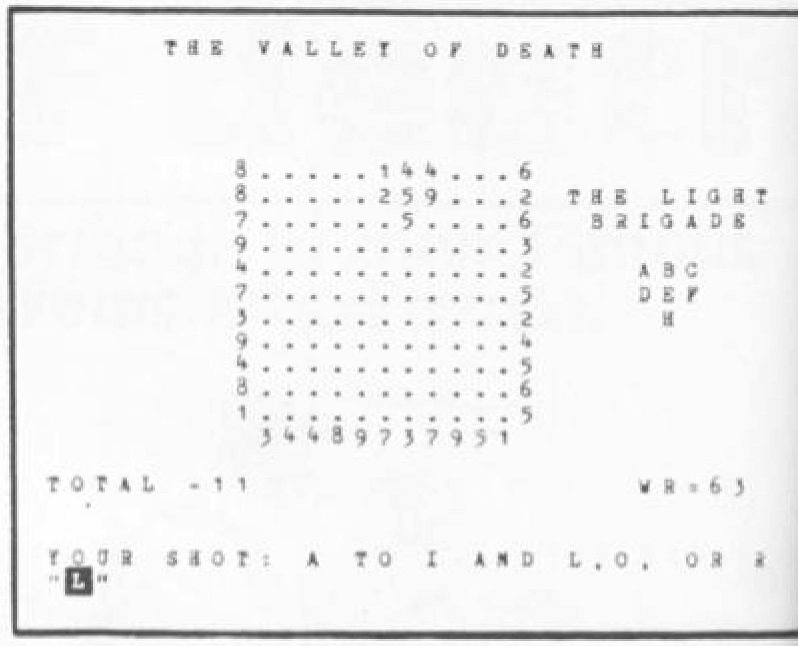


Fig.4. Cannon to right. The cannon to the right hits the soldier at position I. Lose 3 points.

Now it is your turn to return the fire, though in this case all the choice targets are, regrettably, out of range. The best shot would seem to be to fire rightwards from soldier H. This is done by inputting HR.



```
  10 DIM A(3,11)
  20 DIM B(3,3)
  50 RAND 0
  60 FAST
  70 PRINT TAB 5;"THE VALLEY OF
DEATH"
  80 LET MOVE=0
  90 LET FORCE=0
 100 LET F=0
 110 LET M=1
 120 LET N=6
 130 LET X=2
 140 LET TOT=0
 150 LET C$="
                   "
 160 LET WR=63
 170 PRINT AT 6,22;"THE LIGHT";T
AB 23;"BRIGADE",,,TAB 25;"ABC";T
AB 25;"DEF";TAB 25;"GHI";AT 18,2
5;"WR=";WR
 180 LET B$=""
 190 FOR I=1 TO 3
 200 FOR J=1 TO 11
 210 LET A(I,J)=INT (RND*9+1)
 220 GOTO 230+(3-I)*20
 230 PRINT AT 4+J,6;A(1,J);"....
.......";A(3,J)
 240 GOTO 270
 250 LET B$=B$+CHR$ (28+A(2,J))
 270 NEXT J
 280 NEXT I
 290 PRINT TAB 9;B$
 300 GOSUB 1200
 310 SLOW
 320 LET MOVE=MOVE+1
 330 PRINT AT 21,0;"YOUR SHOT: A
 TO I AND L,O, OR R"
 340 IF MOVE=1 THEN PRINT AT 21,
0,"ADVANCE INTO VALLEY:     "
 350 INPUT B$
 360 PRINT AT 20,0;C$;TAB 0;C$
 370 IF NOT ((LEN B$=2 AND MOVE>
1) OR (LEN B$=1 AND MOVE=1)) THE
N GOTO 330
 380 LET B$=B$+B$
 390 IF CODE B$(2)<49 OR CODE B$
(2)>55 THEN GOTO 330
 400 LET X=(CODE B$(2)-49)/3+1
 410 IF MOVE=1 THEN GOTO 550
 420 IF CODE B$<38 OR CODE B$>45
THEN GOTO 330
 430 LET G=INT ((CODE B$-37.5)/3
)+1
 440 LET H=CODE B$-37-3*(G-1)
 450 IF B(G,H)<1 THEN GOTO 330
 460 LET FIRE=-1
 470 LET D$="*"
 480 LET RANGE=B(G,H)
 490 LET MI=M+G-2
 500 LET NI=N+H-2
 505 IF X<>2 AND MI<1 THEN GOTO
330
 510 GOSUB 1400
 520 IF FIRE=-1.1 THEN GOTO 330
 530 IF SCORE>0 THEN PRINT AT 21
,0;"GOOD SHOT. SCORE ";SCORE
 540 GOSUB 1900
 550 LET F=SGN (9.5-MOVE)
 560 LET M=M+F
 570 LET N=N+X-2
 580 IF N>1 AND N<11 THEN GOTO 6
10
 590 LET N=N-X+2
 600 LET X=2
 610 GOSUB 1200
 620 LET Q1=B(3,1)+B(3,2)+B(3,3)
 630 LET Q2=Q1+B(2,1)+B(2,2)+B(2
,3)
 640 IF MOVE=20 OR (MOVE=19 AND
Q1<=-3) OR (MOVE=18 AND Q2<=-6)
THEN GOTO 2000
 650 FOR X=1 TO 3
 660 PRINT AT 21,0,C$
 670 LET FIRE=1
 680 LET R=3
 690 IF MOVE>17 THEN LET R=20-MO
VE
 695 LET Q=N+1
 700 LET P=N
 705 IF X<>2 THEN LET Q=M+1
 710 IF X<>2 THEN LET P=M+3-R
 720 FOR V=P-1 TO Q
 730 IF A(X,V)<>0 THEN GOTO 770
 740 NEXT V
```

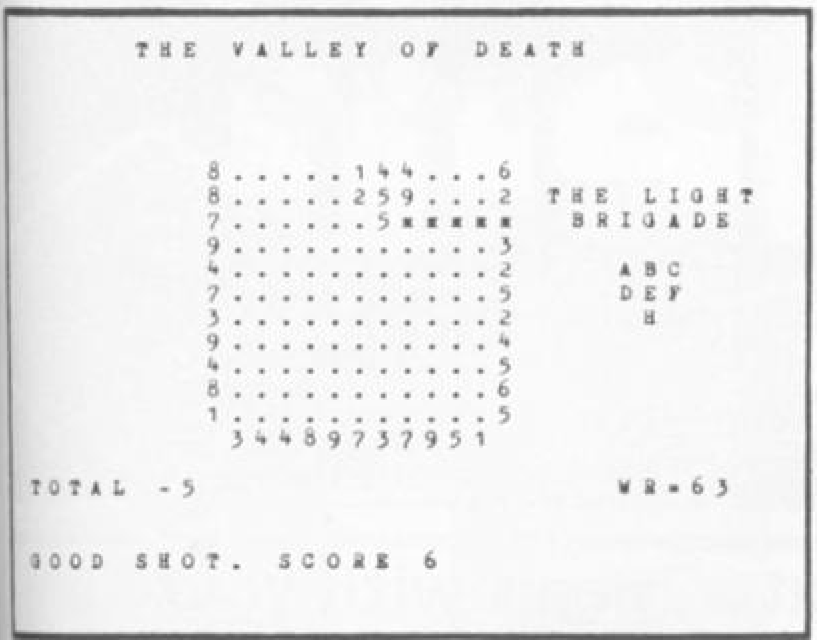


Fig.5. Revenge is sweet. Your shot hits a cannon of strength 6, gaining you 6 points. Your total score is now −5.

Having fired to the right, the Light Brigade will now advance one step rightwards.

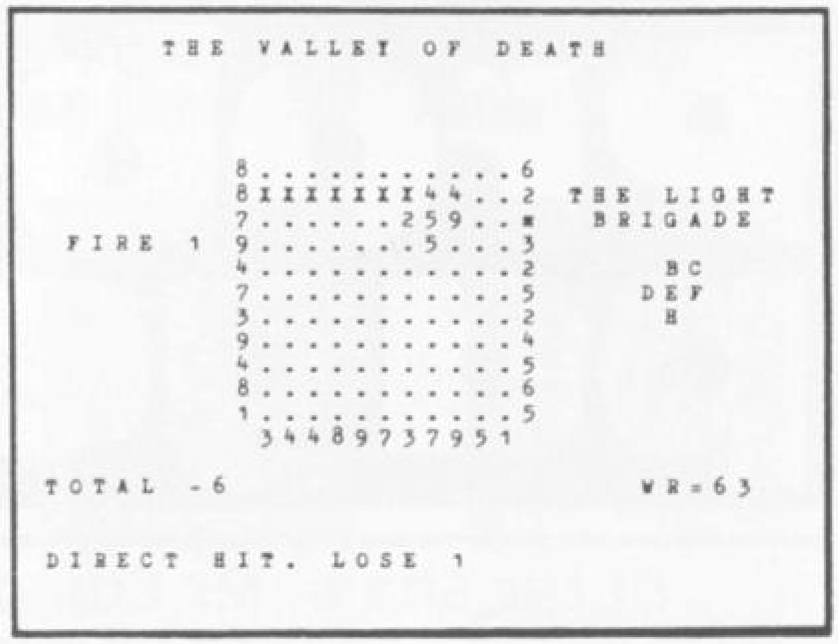
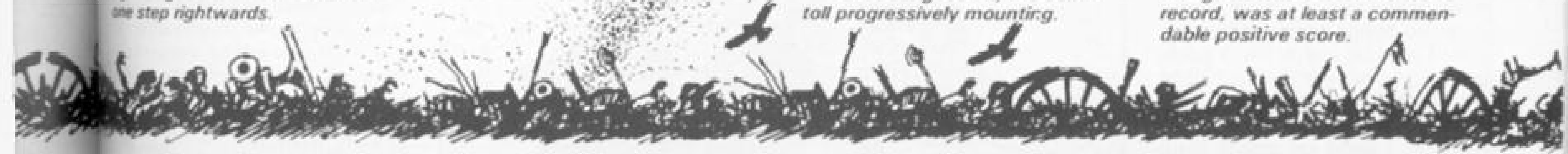


Fig.6. Cannon to left, again. Once again the Enemy fires its three shots and once again more of your men bite the dust. The first to go is the soldier at position A.

And so it goes on, the death-toll progressively mounting.

Final result. This particular charge ended unsuccessfully. None survived – the last man to fall being the one at position C. The total score at the end was 8 which, though nowhere near the world record, was at least a commendable positive score.



```
750 NEXT X
760 GOTO 320
765 IF X<>2 THEN LET P=M
770 IF X=2 THEN LET R=3
775 LET CANNON=INT (RND*R+2-R)
780 IF A(X,P+CANNON)=0 THEN GOT
O 770
790 LET MI=P+CANNON
800 LET RANGE=A(X,MI)
810 LET NI=MI
820 IF X=2 THEN LET MI=12
830 IF X<>2 THEN LET NI=(X-1)*6
840 LET D$="X"
850 PRINT AT 8,1;"FIRE ";X
860 GOSUB 1400
870 IF SCORE<0 THEN PRINT AT 21
,0;"DIRECT HIT. LOSE ";ABS SCORE
;AT 8+G,24+H;" "
880 GOSUB 1900
890 IF FORCE<=0 THEN GOTO 2000
900 GOTO 750
1200 LET Z=N+7-X+2
1210 DIM C(11,11)
1260 PRINT AT 3+M-F,Z;"...";TAB
Z;"...";TAB Z;"...";AT 3,Z;"   "
;TAB Z;"   "
1270 FOR G=1 TO 3
1280 FOR H=1 TO 3
1290 IF MOVE>0 THEN GOTO 1320
1300 LET B(G,H)=INT (RND*9+1)
1310 LET FORCE=FORCE+B(G,H)
1320 IF MOVE>17 AND B(G,H)=-1 AN
D M+G-2<1 THEN LET B(G,H)=-28
1330 PRINT AT 2+M+G,6+N+H;CHR$ (
28+B(G,H))
1340 IF M+G-2>0 THEN LET C(M+G-2
,N+H-2)=B(G,H)
1350 NEXT H
1360 NEXT G
1370 RETURN
1400 LET SCORE=0
1410 FOR S=1 TO RANGE
1420 LET T=-S*FIRE
1430 LET U=S*(2-X)*FIRE
1435 IF X<>2 THEN LET T=0
1440 PRINT AT MI+T+4,NI+U+8;D$
1450 IF NI+U<1 OR NI+U>11 OR MI+
T>11 THEN GOTO 1490
1460 IF C(MI+T,NI+U)>0 THEN GOTO
 1550
1470 NEXT S
1480 RETURN
1490 LET RANGE=S-1
1500 LET Y=MI
1510 IF X=2 THEN LET Y=NI
1520 LET SCORE=A(X,Y)
1530 LET A(X,Y)=0
1540 RETURN
1550 IF FIRE=-1 THEN GOTO 1650
1570 LET RANGE=S
1580 LET G=MI+T-M+2
1590 LET H=NI+U-N+2
1600 LET SCORE=-B(G,H)
1610 LET FORCE=FORCE+SCORE
1620 LET B(G,H)=-1
1630 LET C(M+G-2,N+H-2)=0
1640 RETURN
1650 LET FIRE=-1.1
1655 PRINT AT 20,0;"ILLEGAL SHOT
: """;B$(1 TO (LEN B$)/2);"""". T
RY AGAIN"
1657 PRINT TAB 0;"IN A SECOND"
1660 GOSUB 1200
1670 RETURN
1900 LET TOT=TOT+SCORE
1910 PRINT AT 18,0;"TOTAL ";TOT;
"   "
1920 IF RANGE=0 THEN RETURN
1930 LET D$="."
1935 PRINT AT 8,1;"         "
1940 GOSUB 1400
1950 RETURN
2000 PRINT AT 19,0;"END OF CHARG
E ";TAB 0;"NO SURVIVORS"
2010 IF FORCE>0 THEN PRINT AT 20
,0;"SURVIVORS ";FORCE;" ADDED TO
 SCORE"
2020 LET SCORE=FORCE
2030 GOSUB 1900
2040 PRINT AT 21,0;"WORLD RECORD
 REMAINS UNCHANGED"
2050 IF TOT>WR THEN PRINT AT 21,
13;"BEATEN. WELL DONE"
2060 STOP
```

Problem page



Peter Shaw, Mr Computer, deals with your programming problems.

Dear Peter,
I already have a ZX Spectrum and Interface 1, and have recently bought a BBC Micro. A friend of mine made me a cable so I could connect the RS232 of the Spectrum to the RS432 on the BBC. Now I have this set up, how do I send programs from the Spectrum to the BBC?

Clive Giffvincent,
Fairfield,
Liverpool.

Clive,
The BBC and Spectrum with Interface are directly compatible, and providing your cable is correctly wired-up you can send programs over in the following manner:
on the BBC type;

```
*FX 5,2     ; select serial
              input/output
*FX 2,1     ; get input from
              RS432 port
```

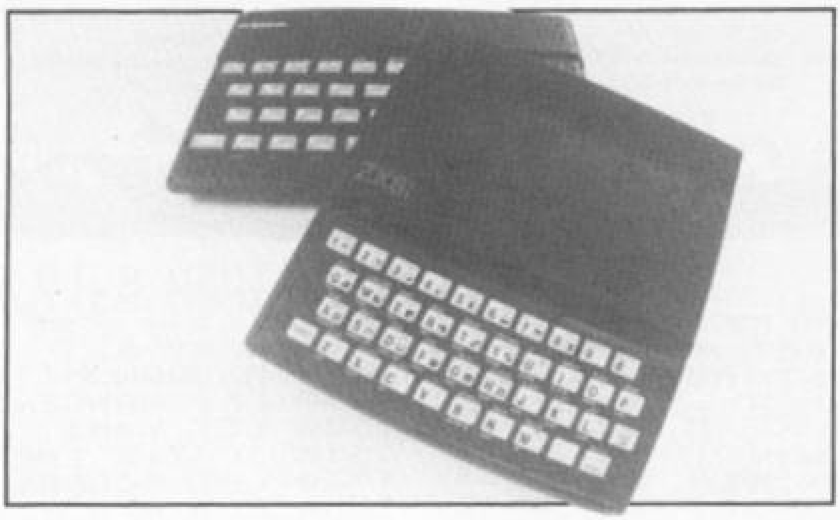
on the Spectrum type;

```
OPEN #4; "t"
LIST #4
```

The program will squirt down the cable and appear on your BBC. Once the Spectrum has finished with the O.K. report, press BREAK on the BBC, and then type:

```
OLD (return)
LIST (return)
```

Hey-presto, there's your program.
You will now need to go through it, taking out the spaces between GO TO, GO SUB, etc, and any other changes that the program needs.



Dear Peter,
I have been getting extremely frustrated recently over the quality of my display. Is it possible to get a monitor for the Spectrum, which I can use on other systems if I decide to expand?

Tim Freddrick,
Shepherds Bush,
London, W12

Dear Tim,
What you are after is the Microvitec Cub 452-1431/MZ which is exactly the same as the monitor used on the BBC by Acorn, except that it also has a Spectrum interface. You may have seen Sinclair using them at Computer fairs. You can get details from Microvitec, Futures Way, Bolling Road, Bradford, West Yorkshire BD4 7TU.

Dear Peter,
I have been using a Spectrum at school for over a year now, (I hope to get one for Christmas) but have never had a chance to find out what some of the commands do. For example, the commands ATTR, ABS, IN, OUT and POINT. I have only had time to glance at the manual, and have never taken much notice of these commands. Could you help?

John Conner,
Ashford,
Middlesex.

John,
Your best bet is to buy a book which will teach you BASIC and explain all these commands in detail. Programming your ZX Spectrum (Interface) is one of the best of these, also Getting Started on your Spectrum (Futura) and The ZX Spectrum (Granada).
To get back to your current problem, ATTR (x,y) returns the attribute of the character square x,y; ABS x returns the absolute value of x, i.e. the positive value. IN x returns the number in the port x. OUT x puts a number through port x. Unlike PEEK and POKE, these values are always changing, depending on the system.
POINT (x,y) returns 1 if pixel x,y is set, and 0 if it is reset.

Dear Peter,
I have been using the Tasword Two recently, but find the Spectrum keyboard impossible to use. Can you advise me on buying a full typewriter keyboard for my machine.

Joan Rutherford,
Goes,
Zeeland,
The Netherlands.

Joan,
Liverpool based Fuller Micro's have two types of keyboard for the Spectrum. The first, the FD42, is a nice unit, but not a fully professional typewriter style, and costs £29.95; the FDS is a much more professional keyboard (although they are difficult to get hold of at the moment) and is priced at £49.95. DkTronics have a keyboard which is nearly as good as the FDS for £45, and I believe Kayde still make a keyboard for the Spectrum, although I do not know how much it costs.

To all of you who wish to start your computer club, please remember tht you can get one of the Staines and Stanwell Computer Club's information sheets on starting your own club by sending an SAE to:

Computer Club Info Sheet
c/o Problem Page
ZX Computing
1 Golden Square
London W1R 3AB

If you are sending your SAE with a problem, please mark the SAE COMPUTER CLUB INFO SHEET, to save any confusion.

Interface 2

Our reviewer, Peter Shaw, takes a look at one of the latest Sinclair releases.



Sinclair's new black box appeared while we were still trying to get over the Microdrive launch. ROM software is something Sinclair users will not have come in contact with unless they have a video game machine, and even then there are many differences.

The facts

Before I go on, I'll explain exactly what the Interface 2 is: A two-joystick interface + ROM cartridge software socket, contained within a small black box, oddly shaped with a stepped level which is difficult to describe without you actually seeing one.

The ROM cartridge idea was pretty smart, although the software that is available at the moment is obviously biased towards the game player. I would have preferred to see a word-processor, like Tasword, or a dissasembler, like Zeus, on cartridge. These sort of programs are more suited towards the ROM slot. Obviously you cannot 'save' your own programs on cartridge, and with commercial cartridges at £14.95 I doubt whether anybody will have more than three cartridges in their collection.

The physical shape of the cartridges, and the way they are connected to the slot is very odd. The cartridge has a red plastic 'skirt' which rides up to reveal an edge connector: on the Interface itself there is a female connector below a plastic 'door'. In theory the cartridge simply plugs in the female connector, just by pressing the cartridge in. It took me some time to get one of the cartridges in the right place. I don't think it's going to do the Interface a lot of good with all these users shoving their cartridges in willy-nilly.

The joystick Interface will accept any 9-way D-type connector Joystick, ie the Atari or Kempston sticks. The joystick connectors are protected by two small covers which took me all of two days to lose. Joysticks can be plugged into, and unplugged from the computer at any time without causing it to crash.

Joysticks 1+2 work on the keys 1-0 in the following way; The instructions supplied with the Interface was not without many errors, carefully corrected with a black biro.

Key	Joystick 1	Key	Joystick 2
1	Left	6	Left
2	Right	7	Right
3	Down	8	Down
4	Up	9	Up
5	Fire	0	Fire

Of course, in BASIC you could not read more than one key at a time using the INKEY$ command. But you can use the IN command;

IN 63486	Joystick 1	IN 61438	Joystick 2
bit 4	Fire	bit 0	Fire
bit 3	Up	bit 1	Up
bit 2	Down	bit 2	Down
bit 1	right	bit 3	right
bit 0	left	bit 4	left

A conclusion

The Interface is pretty good value at only £19.95, but the cartridges are very pricey at £14.95. It might be worth buying the Interface just for the joystick interface, which are obviously become standard. Sinclair Research, 25 Willis Road, Cambridge CB1 2AQ.

Patience

Have you got the patience to play Mike Eida's excellent card game program?

This started life as a programming exercise but soon developed into a challenge. When finished I not only had a good game but had also used just about every programming procedure in the book — it was this that made me think that it would be useful to others who may be struggling a bit.

The game played is the 'standard' Patience. There are seven piles of cards each having one more card than that to its left. The first pile has only one card and the last card on each pile is face up. The remaining cards form a reserve. To play, any card may be placed on top of another of the other colour and it must be one less in value, ie nine of clubs on ten of hearts. You win with four columns from King down to Ace. You may play a variation whereby the Aces are placed above the play and you can put on each Ace the next card of that suit. In this case you win by having four complete suits.

The game starts by the ZX81 telling you what it is doing and laying out the starting position with only seven cards showing. If you cannot go, press Newline and one of the reserve cards will be shown. If that card is used the card under it becomes visible and is playable if required. The reserve cards are turned over in threes. You have lost when no more moves are possible. At this point an input of 'R' will give a shuffle and a new deal.

To place one card on another type first the card to be moved followed by the card to be covered. To put an Ace above the playing area input it alone. The same applies to build on the Ace. The program will not let you cheat and is utterly 'mugproof'. Be warned — if you input a card that is not visible or try to place one card in the middle of a line then the computer won't play!!

How it works

Now lets see how it all works. The pack of cards is made in lines 2 to 35. It resides in the string C$. Many programs use an array at this point but that at times makes it harder to use later on. Line 2 is essential to initialise the string, ie to tell the computer to expect it. Then when it gets to line 25 the C$ after the = won't cause an error. Also in this line we use the handy adding or concatenation (horrible word), of strings. This just makes C$ equal to one string containing the various titles. In this part two loops are used one inside and the other to join the numbers of the cards to the sits which are in strings E$ and B$. The first time through the loop B$(N) will be 'H' and will remain so while E$ takes on the values of A to K as M goes from 1 to 13. Only then will the program run past line 30 and let N increase to 2. When complete C$ will = 'AH2H3H....... JSQSKS'.

Lines 40 to 70 shuffle the pack just made. First a loop is set up the length of C$ (52 cards — 2 letters per card = 104) and we want to look at each card in turn — STEP 2. Line 45 follows A to take on a random number from 0 to 103 inclusive. Now the beginning of each card name in string C$ is an odd number from the start so line 50 makes A always odd. If it were even then the statement would be true, INT the whole number part of the division would equal the division A/2, and A would be increased by one making it odd. Line 55 stores the first card in our string in D$. This is only a temporary store. The first card in the string C$ is even then changed for the card selected by the random A. We now have two cards the same so line 65 lets the random card be equal to what was the first card from the temporary store D$. By the time N reaches 104 the pack is well and truly shuffled.

Lines 74 to 93 set up variables to be used later. Z is made equal to the start of the display file plus 66. This is the address of the beginning of the third line on the screen when the game is displayed so the computer will know where to start looking for the cards.

The next loop (lines 95 to 109) prints the card to the screen. C specifies the line and B the column into which the card is placed: C$ (A TO A+1) but only if it is the first card in that line: line 100 sees to that. Line 103 prints the blanks and puts the CHR$ A so the computer knows which card is hidden. In this way we are playing with a real pack and not with randomly selected cards. This may be more important for some games. A is then increased by two to look at the next card in C$ Line. 114 changes the line, 115 spaces the cards and 117 reduces the number of cards in each line. Line 120 checks to see if D has reached 0 and if not it goes back for more cards. This works thus: 'IF variable is not zero THEN carry this out'.

V$ contains the rest of the cards not dealt. There is nothing after the word TO. The computer will assume 'to the end of the string' if we don't tell it where to stop.

Line 130 will let us INPUT a card to the game.

Getting into action

Now we come to a series of instructions so that the input can be translated into actions. 131 shuffle and deal again. 135 not enough input do it again. 136 if a king is to be moved to an empty column and the game rules state that ONLY a king may do this, then do it. 137 to make sure the cards are of the other colour. The codes of H and D are odd and C and S are even so only one of each pair together will come out odd. If they are even then input again. 138 a sub routine explained later. 139 V$ is the reserve pack if it has all gone the next line won't work to skip it. 140 is the first card you input is the one showing on the reserve pile then another subroutine is required. This time GOSUB may be used instead of GOTO because the program will always come back to 142, ie the subroutine will not send it elsewhere. If it did then return addresses would pile up on the GOSUB stack and clog the memory with information that would never be used. 142 prepare another string.

Another loop from 144 to 150. This one looks at the cards on the screen. Remember we set Z earlier on. Now if we add N to it we can look along the screen lines for the card we want. If we PEEK the address of a spot on the screen we will get the CODE of whatever is printed there. 0 is a space. 145 if a space then next one please. 146 we're using X here to say whether we're looking at teh first card in the input A$ or the second 0 is the first card. Well if A$ is only one card LEN + 2, how can it be the second one we look at? This is because it is a card already laid in the game and we want to put it on its suit pile above the playing area. 147 if the first card equals a card in the game go to a subroutine. 148 if it's one card skip the next line. 149 if the second card equals one on the game go to sub routine.

When this loop ends and we reach 155 it must mean that one or other cards did not exist. You've been caught cheating!!

Lines 160 and 168 move the selected card and uncover the one beneath. 160 if the card above the one picked is not a covered card then subroutine. It finds the one above by taking 33 from the present position. There are 32 characters to each line and each line is followed by a Newline character so that the memory knows where the lines end. 161 if we try to move a card to its suit pile and it's not on the end of a column then input again. 162 & 163 rub out the card to be moved. 164 Y has collected a value from a sub routine the card is the top one in a column, then go to subroutine. If +33 = 0 (a space) it must be the top. Line 160 told us there was no card above. 166 & 167 look at the blank above the wiped out card and read its CODE. We put that there earlier so that we knew which card was hidden. This will tell us where it is in C$. Now we have to convert it, the card in C$ that is, to CODE so that it may be POKEd. 168 to blank out the extra character used for face down cards. 187 if there are more cards under the one just rubbed out got to subroutines to remember them. 188 add one to X. 189 zero Y. 190 if we have not looked at both cards of the input go back and look at the second one. 191 we've looked at both go back for more input. ▶

On the other hand

192 & 193 a subroutine to print two full stops at the top of an empty column. 197 to 202 all the second cards of the input come here. If the second input is not '. . .' then 33 is added. You are now looking at the line below the rubbed out first card and if it's not blank (line 200) then you are trying to place one card on another, cheating AGAIN!!!! If the second entry is '. . .' then 197 will look at the line above and line 198 will cancel it and look at the correct line to find the dots. 199 if the dots are there go ahead and print the King. The fact it is a King has been checked already — we'll get to that sub routine later.

201 and 208 prints the rubbed out card and any that were below it, beneath the card selected by the second input. That is the second card of the input A$. 201 & 202 print rubbed out card. 203 if no more cards under rubbed out card go back to say second part of operation complete, ie X now is 2. 204 get next line ready. 205 & 206 print next card in Z$. 207 let Z$ equal what it was less the first card already printed. 208 if there are more cards in Z — go back and print them. 209 Z$ is empty go back — operation complete.

220 & 230 is one of the routines to find out which suit the first card is by comparing it with B$.

237 & 238 subroutine to put a single card on its suit pile above the game. N is the suit found above times 3 then POKE it in position two lines above the game Z-66 and along N times suit spaces along that line.

252 to 255 subroutine to select a card from the reserve pack and print it below the game. 252 move along 3 cards. 253 is F gets too small start at the beginning again. 254 is V$ is empty don't try to print it in the next line. 255 print the card where indicated.

280 to 295 subroutine to rub out reserve card used and print in its place the one underneath. 280 the card printed is V$ (F TO F + 1): this line removes it from V$. 282 if V$ is empty then skip the lines used to print it. 284 F must be at least 3 so that V$(F − 2) may be printed. 286 print the card one less than V$(F TO F + 1), ie the one underneath. 287 adjust F so that the next card printed from the reserve will be 3 on from the underneath card and not from the original. 293 let user know reserve pack is empty. 294 let computer know that step is completed. 295 go to line after GOSUB statement that brought us to line 280 in the first place. 300 to 307 is a loop to make sure the two cards in input A$ are only one number different and that the first one is the lower. 301 if there are two cards in input skip the next two lines. 302 if thre is one card and it's not an Ace and there are no cards already laid above the game then you can't do it. 303 this is a way of re-using the IF statement. If there is something in the suit pile above the game and is the card is not the next one as compared with string E$ then you can't do it. 304 if only one card skip the next line. 305 if the numbers of the two input cards do not follow correctly start again.

Checking up

Now the last loop was looking for those cards which were NOT correct. Loops are usually used to find items which satisfy criteria but using it this way round allows us to use the same loop twice and send the correct items in each pass to different places in the program. 308 if X is not zero go to one place. 310 if X therefore is zero then go to another.

315 to 325 are statements to show cheating and to stop the game. There must eventually be some punishment for persistent short cut takers!

330 this has been put here purposely to show that a SAVE statement ned not be put at the end of the program. If you start your tape and enter GOTO 330 then NEWLINE, the program will be saved with the title 'P'. When you play it back with LOAD 'P' it will do so when it sees line 335 RUN without listing the program first. This can be very important with programs which have variables stores in memory and these are needed to make it work. RUN will destroy all memory so if you put GOTO after the SAVE statement then you won't rub them out in error.

Lines 350 to 355 end sub routine — all inputs come here to find out if there are cards above or below. 350 identify blank above — top of column. 351 one card only in input and it's not the bottom card in column; illegal. 352 give value to Y so that the difference can be seen between a blank above the first card entered, exposed card above or a covered card above.

Having played the game and studied the program with these notes it is hoped that not only do you understand how it works but that the various methods used will enable you to write better programs yourself.

```
   1 PRINT "I AM MAKING AND SHUF
FLING A PACK OF CARDS TO PLAY ""P
ATIENCE"""
   2 LET C$=""
   5 LET B$="HCDS"
  1Ø LET E$="A23456789TJQK"
  15 FOR N=1 TO 4
  2Ø FOR M=1 TO 13
  25 LET C$=C$+E$(M) +B$(N)
  3Ø NEXT M
  35 NEXT N
  39 PRINT "I AM SHUFFLING THE P
ACK NOW"
  4Ø FOR N=1 TO 1Ø4 STEP 2
  45 LET A=INT (RND*1Ø4)
  5Ø IF A/2=INT (A/2) THEN LET A
=A+1
  55 LET D$=C$(N TO N+1)
  6Ø LET C$(N TO N+1)=C$(A TO A+
1)
  65 LET C$(A TO A+1)=D$
  7Ø NEXT N
  72 CLS
  73 LET F=1
  75 LET Z=PEEK 16396+PEEK 16397
*256+66
  9Ø LET C=3
  91 LET B=Ø
  92 LET D=7
  93 LET A=1
  95 FOR N=1 TO D
 1ØØ IF N>1 THEN GOTO 1Ø3
 1Ø1 PRINT AT C,B+3*N;C$(A TO A+
1)
 1Ø2 GOTO 1Ø8
 1Ø3 PRINT AT C,B+3*N;"h"+CHR$ A
+"h"
 1Ø8 LET A=A+2
 1Ø9 NEXT N
 114 LET C=C+1
 115 LET B=B+3
 117 LET D=D-1
 12Ø IF D THEN GOTO 95
 125 LET V$=C$(57 TO )
 128 LET Y=Ø
 13Ø INPUT A$
 131 IF A$="R" THEN GOTO 38
 132 IF LEN A$=1 OR LEN A$=3 THE
N GOTO 13Ø
 133 IF A$="" THEN GOTO 25Ø
 134 LET X=Ø
 135 IF LEN A$=2 THEN GOTO 138
 136 IF A$(1)="K" AND A$(3)="."
THEN GOTO 139
 137 IF (CODE A$(2)+CODE A$(4))/
2=INT ((CODE A$(2)+CODE A$(4))/2
) THEN GOTO 13Ø
 138 GOTO 22Ø
```

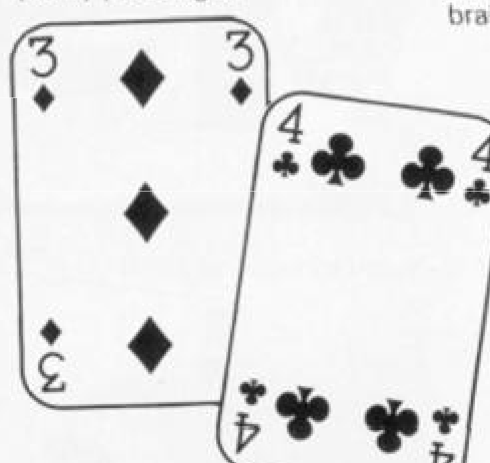
```
 139 IF LEN V$=0 THEN GOTO 142
 140 IF A$(1 TO 2)=V$(F TO F+1)
THEN GOSUB 280
 142 LET Z$=""
 144 FOR N=1 TO 16*33 STEP 3
 145 IF PEEK (Z+N)=0 THEN GOTO 1
50
 146 IF X=1 AND LEN A$=2 THEN GO
TO 220
 147 IF X=0 AND PEEK (Z+N)=CODE
A$ AND PEEK (Z+N+1)=CODE A$(2) T
HEN GOTO 160
 148 IF LEN A$=2 THEN GOTO 150
 149 IF X=1 AND PEEK (Z+N)=CODE
A$(3) AND PEEK (Z+N+1)=CODE A$(4
) THEN GOTO 197
 150 NEXT N
 155 GOTO 315
 160 IF PEEK (Z+N-33)<>136 THEN
GOTO 350
 161 IF LEN A$=2 AND PEEK (Z+N+3
3) THEN GOTO 130
 162 POKE Z+N,0
 163 POKE Z+N+1,0
 164 IF Y AND PEEK (Z+N+33)=0 TH
EN GOTO 188
 166 POKE Z+N-33,CODE C$(PEEK (Z
+N-32))
 167 POKE Z+N-32,CODE C$(PEEK (Z
+N-32)+1)
 168 POKE Z+N-31,0
 187 IF PEEK (Z+N+33) THEN GOTO
210
 188 LET X=X+1
 189 LET Y=0
 190 IF X<>2 THEN GOTO 144
 191 GOTO 130
 192 POKE Z+N,27
 193 POKE Z+N+1,27
 194 GOTO 187
 197 IF A$(3)="." THEN LET N=N-3
3
 198 LET N=N+33
 199 IF PEEK (Z+N)=27 THEN GOTO
201
 200 IF PEEK (Z+N) THEN GOTO 320
 201 POKE Z+N,CODE A$
 202 POKE Z+N+1,CODE A$(2)
 203 IF Z$="" THEN GOTO 188
 204 LET N=N+33
 205 POKE Z+N,CODE Z$
 206 POKE Z+N+1,CODE Z$(2)
 207 LET Z$=Z$(3 TO )
 208 IF Z$<>"" THEN GOTO 203
 209 GOTO 188
 210 LET Z$=Z$+CHR$ (PEEK (Z+N+3
3))+CHR$ (PEEK (Z+N+34))
 211 POKE Z+N+33,0
 212 POKE Z+N+34,0
 214 LET N=N+33
 215 GOTO 187
 220 FOR N=1 TO 4
 225 IF B$(N)=A$(2) THEN GOTO 30
0
 230 NEXT N
 237 POKE Z+N*3-66,CODE A$
 238 POKE Z+N*3-65,CODE A$(2)
 239 GOTO 130
 252 LET F=F+6
 253 IF F>=LEN V$ THEN LET F=1
 254 IF V$="" THEN GOTO 130
 255 PRINT AT 18,8;V$(F TO F+1)
 265 GOTO 130
 280 LET V$=V$(1 TO F-1)+V$(F+2
TO )
 282 IF V$="" THEN GOTO 293
 284 IF F<3 THEN LET F=3
 286 PRINT AT 18,8;V$(F-2 TO F-1
)
 287 LET F=F-2
 293 IF V$="" THEN PRINT AT 18,4
;"RESERVE PACK EMPTY"
 294 LET X=X+1
 295 RETURN
 300 FOR M=1 TO LEN E$-1
 301 IF LEN A$=4 THEN GOTO 304
 302 IF PEEK (Z+N*3-66)=0 AND A$
(1)<>"A" THEN GOTO 130
 303 IF PEEK (Z+N*3-66)=CODE E$(
M) THEN IF A$(1)<>E$(M+1) THEN G
OTO 130
 304 IF LEN A$=2 THEN GOTO 307
 305 IF A$(1)=E$(M) AND A$(3)<>E
$(M+1) THEN GOTO 130
 307 NEXT M
 308 IF X THEN GOTO 237
 310 GOTO 139
 315 PRINT "THAT CARD DOES NOT E
XIST.  I DO NOT PLAY WITH cheats
"
 316 STOP
 320 PRINT "YOU cheat TRYING TO
PUT ONE CARDOVER ANOTHER. I AM N
OT PLAYING  ANYMORE."
 325 STOP
 330 SAVE "P"
 335 RUN
 350 IF PEEK (Z+N-33)=0 THEN GOT
O 192
 351 IF PEEK (Z+N+33)=0 AND LEN
A$  2 THEN GOTO 130
 352 LET Y=1
 354 IF PEEK (Z+N+33) THEN GOTO
130
 355 GOTO 162
```

The Patience listing which occupies 4.25K including variables and screen.
Lower case underlined = Graphics on key.
Lower case = Inverse characters. Words run together will be separated by computer changing lines.

Pelmanism

Be a card and play the game with Simon White of Gloucester.





Can you match the card values with as much skill as your opponent? You need to remember the positions of as many cards as possible to win the game — memory training exercises have never been so much fun!

A pack of cards is shuffled and spread out face down and the players take turns in choosing a pair of cards to turn over. If the card values match then the player wins a point, if not then they're turned back and you will have to remember their positions for your next attempt.

Once the computer has dealt the cards and given each a value, the players can begin by choosing their pairs of cards, To move to the card you have chosen, use key 5 to go left and 8 to go right. Once you have reached the card of your choice, O turns it over. If at any time you want to stop playing you can quit by pressing 0.



So type in this program, put your brain into gear and away you go!

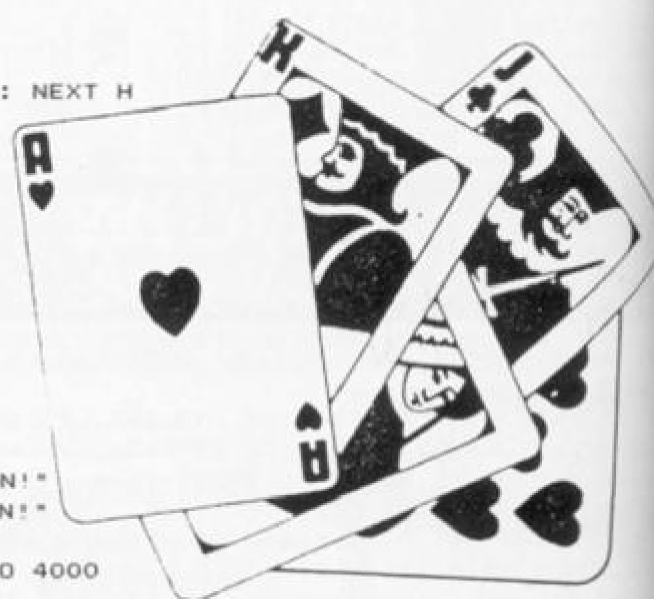
The lines

4 - 5	Sets up user defined variables.
20 - 60	Deals the cards.
63 - 140	Shuffles the cards.
159 - 300	Checks input for cursor movement, quit, or turn card, perform movement of cursor.
403 - 420	Turns over the card (if legal).
450 - 484	Eliminates a matched pair.
1000 - 1500	Prepares for the next players turn.
1510 - 1530	Checks for end of game.
3000 - 4030	End of game routine.
8000 - 8120	Instructions.

STOP! Before typing in this program, please see the Editor's note in the Welcome section.

```
  4 RESTORE 5: FOR a= USR  CHR$ 144 TO ( USR  CHR$ 149)-1: READ B: POKE A,B: NE
XT A
  5 DATA 142,145,145,145,145,145,145,142,0,102,255,255,255,126,60,24,16,56,56,1
24,124,56,56,16,24,24,126,255,126,126,60,24,8,8,107,127,107,8,28,28
 10 BORDER 7: PAPER 7: INK 0: CLS
 12 GO SUB 8000: CLS : LET M=0: LET N=0: LET C=1
 15 PRINT  AT 0,0; FLASH 1;"DEALING .PLEASE WAIT"
 17 DIM A$(8,13): LET i=0
 20 FOR P=1 TO 4: FOP G=1 TO 13: LET A$(P,G)="m": NEXT G: NEXT P
 25 FOR p=14 TO 6+13*16 STEP 16
 30 FOR d=10 TO 160 STEP 40
 40 PLOT p-1,d-4: DRAW 0,34: DRAW 13,0: DRAW 0,-34: DRAW -13,0
 50 NEXT d
 60 NEXT p
 63 PRINT  AT 0,0; FLASH 1;"SORTING .PLEASE WAIT"
 65 FOR D=1 TO 4
 70 FOR X=1 TO 13
 90 LET S= INT ( RND *4)+1
100 LET R= INT ( RND *13)+1
110 IF A$(S,R) <> "m" THEN  GO TO 90
120 IF x<10 THEN  LET A$(S,R)= CHR$ (48+X)
122 IF x >= 10 THEN  LET A$(S,R)=( CHR$ 74 AND x=11)+( CHR$ 75 AND x=12)+( CHR$
81 AND x=13)+( CHR$ 144 AND x=10)
125 IF x=1 THEN  LET a$(s,r)="A"
127 LET a$(s+4,r)=("B" AND d=1)+("C" AND d=2)+("D" AND d=3)+("E" AND d=4)
130 NEXT X
140 NEXT D
145 BEEP .5,20: PRINT  AT 0,0;"                              "
150 LET P=3: LET Q=2
155 FOR G=1 TO 2
160 PRINT  PAPER 5; INK 0; FLASH 1; OVER 1; INK 1; AT P-1,Q;"■"; AT p+2,q;"■"
175 LET g$= INKEY$ : IF g$="" THEN  GO TO 175
```

```
 177 PRINT  AT P-1,Q;" "; AT P+2,Q;" "
 180 IF  INKEY$ ="q" OR  INKEY$ ="Q" THEN  GO TO 3000
 190 LET Q=Q+(2 AND  INKEY$ ="8"): IF Q>26 THEN  LET Q=2: LET P=P+5: IF P >= 20
THEN  LET P=3
 200 LET Q=Q-(2 AND  INKEY$ ="5"): IF Q<2 THEN  LET Q=26: LET P=P-5: IF P<3 THEN
 LET P=18
 250 IF  INKEY$ ="0" THEN  GO TO 400
 300 GO TO 160
 403 IF G=2 AND R=P AND S=Q THEN  GO TO 160
 404 IF A$((P-3)/5+1,Q/2)="X" THEN  GO TO 160
 405 FOR k=0 TO 10 STEP 5: BEEP .008,k: NEXT k
 407 IF G=1 THEN  LET R=P: LET S=Q
 410 PRINT  AT P,Q;A$( INT ((P-3)/5)+1,Q/2)
 413 IF A$( INT ((P-3)/5)+5,Q/2)="C" OR A$( INT ((P-3)/5)+5,Q/2)="B" THEN  INK 2
 415 PRINT  AT P+1,Q;A$( INT ((P-3)/5)+5,Q/2)
 417 INK 0
 420 NEXT G
 425 FOR E=0 TO 150: NEXT E
 430 PRINT  AT R,S;" "; AT R+1,S;" "; AT P,Q;" "; AT P+1,Q;" "
 440 IF A$((P-3)/5+1,Q/2) <> A$((R-3)/5+1,S/2) THEN  GO TO 1000
 450 FOR k=-10 TO 35 STEP 6: BEEP .01,k: NEXT k
 455 LET C=C+1
 460 LET A$((R-3)/5+1,S/2)="X": LET A$((R-3)/5+5,S/2)="X": LET A$((P-3)/5 COPY 1
,Q/2)="X": LET A$((P-3)/5+5,Q/2)="X"
 470 PRINT  AT R,S;"X"; AT R+1,S;"X"; AT P,Q;"X"; AT P+1,Q;"X"
 473 IF V=1 THEN  LET M=M+1
 476 IF V=2 THEN  LET N=N+1
 480 IF V=1 THEN  PRINT  AT 0,0;"PLAYER 1:";M
 482 IF V=2 THEN  PRINT  AT 0,20;"PLAYER 2:";N
 484 PAUSE 50
1010 LET C=C+1
1015 IF  INT (C/2)=C/2 THEN  LET V=2
1020 IF  INT (C/2) <> C/2 THEN  LET V=1
1030 LET H$="PLAYER ": FOR H=1 TO 7: PRINT  AT H+5,30;H$(H): NEXT H
1040 PRINT  AT 13,30;V
1500 LET O1=0
1510 FOR U=1 TO 4: FOR Y=1 TO 13
1520 IF A$(U,Y)="X" THEN  LET O1=O1+1
1530 NEXT Y: NEXT U
1540 IF O1 >= 52 THEN  GO TO 3000
1550 GO TO 150
3005 FOR z=0 TO 2
3010 FOR u=0 TO 30 STEP 4
3020 BEEP .01,u
3030 NEXT u: NEXT z
3045 GO SUB 9600
3050 IF m>n THEN  PRINT  BRIGHT 1; AT 11,5;"PLAYER 1 HAS WON!"
3060 IF N>M THEN  PRINT  BRIGHT 1; AT 11,5;"PLAYER 2 HAS WON!"
3070 IF N=M THEN  PRINT  BRIGHT 1; AT 11,9;"IT'S A DRAW!"
```



```
4000 INPUT " ANOTHER GAME ? "; LINE N$: IF N$="" THEN  GO TO 4000
4010 IF N$(1)="Y" OR N$(1)="y" THEN  RUN
4020 IF N$(1)="N" OR N$(1)="n" THEN  STOP
4030 GO TO 4000
8000 CLS
SC10 PRINT  TAB 10;"PELMANISM"
8020 PRINT  TAB 10;"_________"
8030 PRINT
8040 PRINT
8050 PRINT " CAN YOU MATCH THE CARD VALUES"
8060 PRINT : PRINT "WITH MORE SKILL THAN YOUR ": PRINT : PRINT "OPPONENT ?"
8070 PRINT : PRINT " YOU WILL NEED TO REMEMBER THE ": PRINT : PRINT "POSITIONS O
F AS MANY CARDS AS": PRINT : PRINT "POSSIBLE TO WIN THE GAME."
8080 PRINT : PRINT " TO MOVE CURSOR,USE 5 - LEFT                      8 - RIGH
T"
8085 PRINT : PRINT " USE 'O' TO TURN A CARD OVER"
8090 PRINT : PRINT "PRESS 'Q' TO QUIT GAME"
8100 PRINT #0; FLASH 1;"PRESS ANY KEY"
8110 PAUSE 0
8120 RETURN
9600 FOR q=4 TO 1: FOR w=1 TO 13
9700 IF a$(q+4,w)="B" OR a$(q+4,w)="C" THEN  LET i=2
9800 PRINT  AT 21-q*5+2,w*2;A$(Q,W); INK i; AT 21-q*5+3,w*2;a$(q+4,w): LET i=0:
NEXT W: NEXT Q
9810 RETURN
```

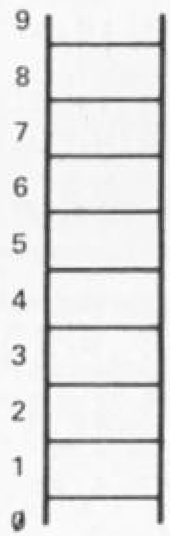
Step by Step

A game of luck and skill — fill in each rung with a suitable number. M Savin shares it with us. Can you beat my best score of 8?

So you'd like to climb the ladder of success, fame and fortune? Well, we can't help you to quite achieve those heady heights, but here is a great game to test your skill and judgement. So let's take it one step at a time and keep alert.

The aim

When you RUN the game, the computer will draw a ladder with numbers down the side from 0 to 9.



The computer then chooses a number from 0 to 99 and it prints:

63 Y or N?

The cunning computer has chosen the number 63 and now expects you to type Y (for yes) or N (for no).
Should you type N, a different number is chosen, but you lose one point from your score.
If you type Y to the number 63, the micro will then print:

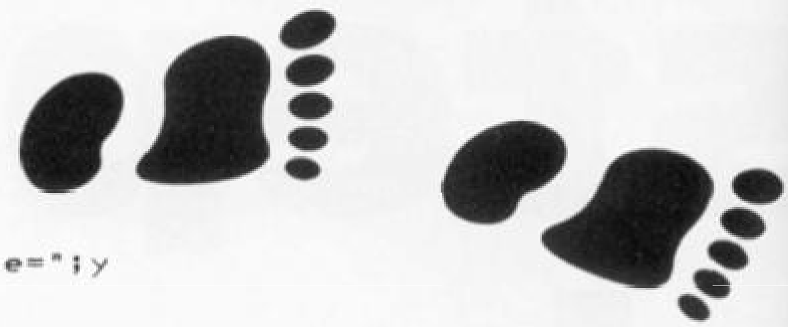
"WHICH BOX WOULD YOU LIKE THE NUMBER 63 TO GO IN (0 TO 9)?"

All you then have to do is type in a number 0 to 9. The aim of the game is to get as many numbers on the ladder as possible in ascending order — and you only get the one chance. Rejecting a number will cost you points and making a wrong decision will limit your future choices.

Your score stands initially at 10 and the most that we managed was 8, so see if you can do better!

```
  1 INK 1: GO TO 1000
  2 LET a=5
  4 LET j=10
  5 DIM b(j)
  6 BORDER 7: PAPER 7: CLS
  7 PRINT  AT 0,a;"  ■■"
  8 FOR m=1 TO 2
  9 FOR v=0 TO 19
 10 POKE 23609,255
 11 PRINT  AT v,a-1;"▌"
 12 NEXT v
 13 LET a=12
 14 LET v=0
 15 NEXT m
 18 LET a=5
 19 LET l=1: FOR n=1 TO 9: PRINT  AT l,a-1; CHR$ 142;"▬▬▬▬▬▬": LET l=l+2: NEXT
n
 20 INK 2
 21 PRINT  AT 2,a;"  ■■"
 22 INK 3
 23 LET w=9: LET q=0: FOR u=1 TO 10: PRINT  AT q,a-3;w;"_": LET q=q+2: LET w=w-
1: NEXT u
 30 PRINT  AT 4,a;"  ■■"
 31 INK 4
 40 PRINT  AT 6,a;"  ■■"
 41 INK 5
 50 PRINT  AT 8,a;"  ■■"
 51 INK 6
 60 PRINT  AT 10,a;"  ■■"
 61 INK 0
 70 PRINT  AT 12,a;"  ■■"
 71 INK 1
 80 PRINT  AT 14,a;"  ■■"
```

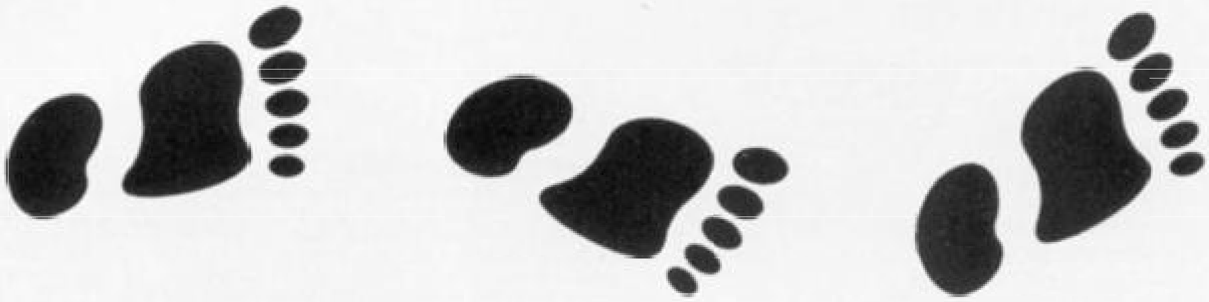




```
 81 INK 2
 90 PRINT  AT 16,a;"  ██"
 91 INK 3
100 PRINT  AT 18,a;"  ██"
101 LET y=0
105 FOR x=0 TO 9
110 LET b(j)= INT ( RND *99)
115 PRINT  AT 0,20; FLASH 1; INK 3;"score=";y
116 IF y=10 THEN  GO TO 200
117 LET y=y+1
120 PRINT  AT 20,0;;"                    "; FLASH 1; INK 0;b(j);"  Y or N?"; INVER
SE 0; FLASH 0;"
122 LET b$= INKEY$ : IF b$="n" THEN  LET x=x+1: IF b$="n" THEN  LET y=y-1: IF b
$="n" THEN  GO TO 110
123 IF b$="y" THEN  GO TO 126
124 IF b$="s" THEN  GO TO 200
125 GO TO 120
130 INK 0: PRINT  AT 20,0;"WHICH BLOCK WOULD YOU LIKE THE"; AT 21,0;"  NUMBER "
;b(j); INK 0;" TO GO IN (0 TO 9)?"
131 INK 2
133 INPUT a$
134 IF a$="" THEN  GO TO 110
135 IF a$="1" THEN  PRINT  AT 16,a;"  "; INVERSE 1;b(j): LET j=j-1
136 INK 1
137 IF a$="2" THEN  PRINT  AT 14,a;"  "; INVERSE 1;b(j): LET j=j-1
138 INK 0
139 IF a$="3" THEN  PRINT  AT 12,a;"  "; INVERSE 1;b(j): LET j=j-1
140 INK 3: IF a$="0" THEN  PRINT  AT 18,a;"  "; INVERSE 1;b(j): LET j=j-1
141 INK 6
142 IF a$="4" THEN  PRINT  AT 10,a;"  "; INVERSE 0; PAPER 6; INK 0;b(j): LET j=
j-1
143 INK 5
144 IF a$="5" THEN  PRINT  AT 8,a;"  "; INK 0; PAPER 5;b(j): LET j=j-1
145 INK 4
146 IF a$="6" THEN  PRINT  AT 6,a;"  "; INK 0; PAPER 4;b(j): LET j=j-1
147 INK 3
148 IF a$="7" THEN  PRINT  AT 4,a;"  "; INVERSE 1;b(j): LET j=j-1
149 INK 2
150 IF a$="8" THEN  PRINT  AT 2,a;"  "; INVERSE 1;b(j): LET j=j-1
151 INK 1
152 IF a$="9" THEN  PRINT  AT 0,a;"  "; INVERSE 1;b(j): LET j=j-1
153 INVERSE 0
154 NEXT x
155 FOR s=1 TO 10
156 IF b(s)=0 THEN  GO TO 170
158 NEXT s
160 NEXT x
161 IF b(1)<b(2) THEN  GO TO 169
162 IF b(3)<b(4) THEN  GO TO 169
163 IF b(5)<b(6) THEN  GO TO 169
164 IF b(7)<b(8) THEN  GO TO 169
165 IF b(9)<b(10) THEN  GO TO 169
168 GO TO 170
169 CLS : FLASH 1: PRINT  AT 10,0;"TRY AGAIN I THINK YOU MADE A       MISTAKE!!
!": BEEP 10,-14: FLASH 0: RUN
170 INK 0: PAPER 4: BORDER 3: CLS : FOR v=1 TO 20: BEEP .1,v: NEXT v
200 CLS : FLASH 1: PRINT  AT 10,8;"your score was ";y
201 IF y >= 8 THEN  PRINT  AT 12,10;"WELL DONE!!!": FOR g=1 TO 20: BEEP .05,g:
NEXT g
```



```
210 FLASH 0
220 INK 0: PRINT  AT 20,0;"would you like to play again?": IF  INKEY$ ="n" THEN
 STOP
221 PRINT  AT 21,0;"Press Y for 'yes' N for 'no'": IF  INKEY$ ="n" THEN  STOP
225 IF  INKEY$ ="y" THEN  RUN 2
230 GO TO 220
1000 PAPER 6: INK 0: BORDER 2: CLS : PRINT  AT 0,2;"@ M. Savin 1982"; FLASH 1; A
T 10,10;"***LADDERS***"
1001 FOR y=1 TO 10
1002 FOR o=1 TO 3
1003 BEEP .1,y
1004 BEEP .1,0
1005 NEXT o: NEXT y
1006 BEEP 3,11
1007 PAPER 7
1008 CLS
1009 INK 2
1010 PRINT  AT 0,7;"***INSTRUCTIONS***"
1020 PRINT
1030 INK 0: PRINT "   The ZX Spectrum will choose  ten numbers which you have to
  place on the ladder in order,the lowest number should be at the bottom of the
 ladder and the     highest at the top.When you see the 'L' press a key from 0-9
and then press the key 'ENTER'      which is on the keyboard on the right hand si
de.If you get 7     numbers on the ladder you have       done very well!!"
1040 PRINT
1045 FLASH 1
1050 PRINT  AT 20,5;"Press any key to start"
9997 PAUSE 0
9998 FLASH 0
9999 GO TO 2
```



SINCLAIR ADD-ONS

1. WEARSAVER
This compact unit (4" x 3" x 1½") has a SAVE/LOAD switch and a 9 volt ON/OFF switch for screen clearing. Simply plug in your EAR and MIC plugs and your power plug.
SPECTRUM Ref WSS **£9.75**
ZX81 Ref ZXS **£9.50 plus P + P 60p**

2. COMPUTER STANDS
POWER BASE
Raised stand for ZX81 and Spectrum. Fitted LOAD/SAVE switch, and power ON/OFF for screen clearing. Saves wear and tear on connections. Front lip holds computer in place. No soldering, comes complete with all necessary plugs and cables.
ZX81 Ref. PBZX81 **£13.25**
With built-in wobble stopper PBZX81W **£17.25**
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These are the real thing. ZX81 memory extensions made for the USA and specifically screened to stop radio interference.
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At last, a fool proof method of avoiding ZX81 white outs caused by Ram-Pack wobble. Simply turn the plastic thumbscrew until the Ram-Pack is held firmly against the ZX81. No soldering, no stick-on pieces, just common sense! Flat or tilted models.
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Lost!

Escape the maze in this exciting program from Pete Cooke of Stoneygate.



Imagine you are trapped in a maze full of poisonous gas and you have to get out into the open air before your air cannister runs out and exposes you to the deadly atmosphere. Well, just type this program into your trusty ZX81 and you'll have to imagine no longer!

There are brief instructions provided within the program, although all you really need to know are the keys you need to move around the maze. To go forwards, you press the '7' key; to go left, press the '5' key; and to move right, press the '8' key. Lots of luck – you're going to need it!

Line by line

Here is a very brief breakdown of what the various lines in the listing do:

Lines 100-230	Form the main loop which receives the player's moves and calls the subroutine at lines 1000-1430 which subsequently works through the maze calling at the print subroutines between lines 2000 and 3285.
Lines 4000-5000	Check to see if you have succeeded in getting out of the maze and offer you the option of another game.
Lines 7000 onwards	Print up the instructions and set up the plan of the maze.

Variables

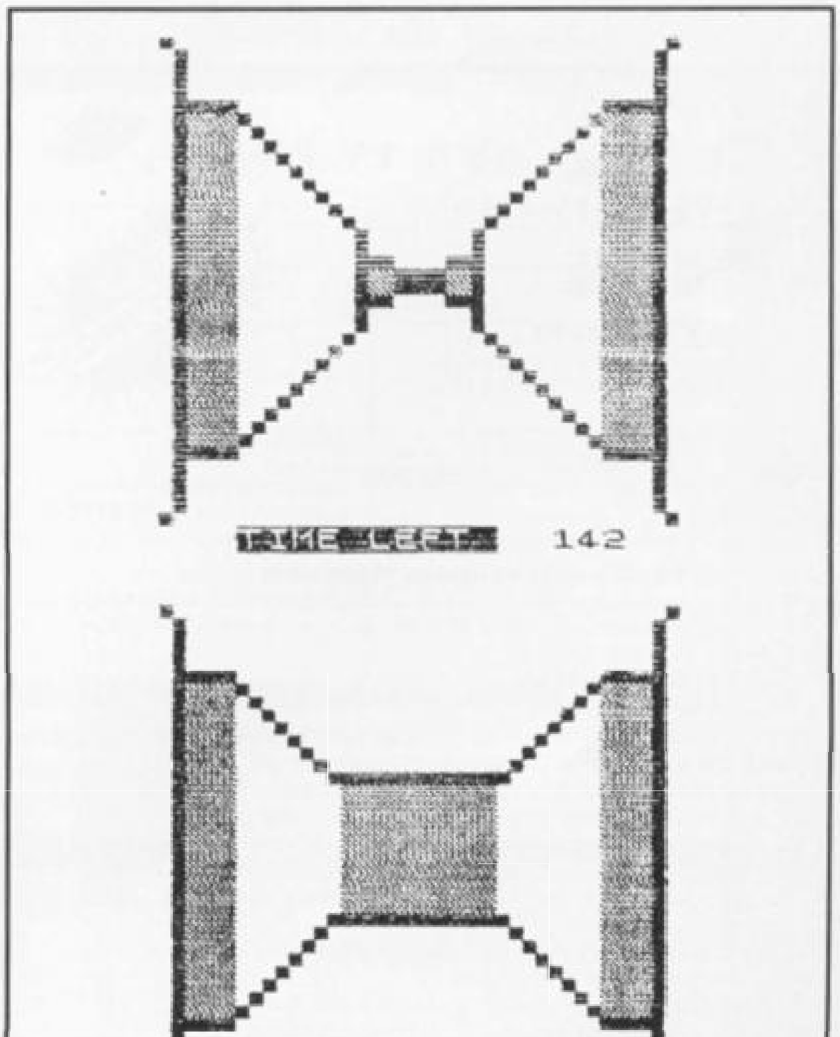
Here listed are the main variables used throughout the listing:

A$ (27,27)	Grid of the maze.
CHR$ 0	Wall.
CHR$ 130	Path.
P(8,2)	Shows four directions N,S,E and W (each is doubled up to simplify checking in the maze).
U and V	Your co-ordinates in the maze.
X and Y	Used to work through the maze.
FX and FY	Forward direction.
LX and LY	Left direction.
P and Q	Position of exit.

```
   1 REM ****MAZE****
   2 RAND
   3 GOSUB 7000
 100 GOSUB 1000
 110 LET Z=CODE INKEY$-28
 120 IF Z<5 OR Z>8 THEN GOTO 110
 130 IF Z=7 THEN GOTO 200
 140 IF Z=6 THEN GOTO 100
 150 IF Z=8 THEN LET D=D+1
 160 IF Z=5 THEN LET D=D-1
 170 IF D>7 THEN LET D=4
 180 IF D<2 THEN LET D=5
 190 GOTO 100
 200 IF CODE A$(U+P(D,1),V+P(D,2
))=0 THEN GOTO 100
 210 LET U=U+P(D,1)
 220 LET V=V+P(D,2)
 230 GOTO 100
1000 FAST
1010 CLS
1020 LET FX=P(D,1)
1030 LET FY=P(D,2)
1040 LET LX=P(D-1,1)
1050 LET LY=P(D-1,2)
1060 LET X=U
1070 LET Y=V
1080 GOSUB 2000+CODE A$(X+LX,Y+L
Y)
1090 GOSUB 2010+CODE A$(X-LX,Y-L
Y)
1100 REM
1110 LET X=X+FX
1120 LET Y=Y+FY
1130 IF A$(X,Y)=" " THEN GOTO 30
00+(30 AND X=P AND Y=Q)
1140 GOSUB 2020+CODE A$(X+LX,Y+L
Y)
1150 GOSUB 2030+CODE A$(X-LX,Y-L
Y)
1160 REM
1170 LET X=X+FX
1180 LET Y=Y+FY
1190 IF A$(X,Y)=" " THEN GOTO 30
60+(30 AND X=P AND Y=Q)
1200 GOSUB 2040+CODE A$(X+LX,Y+L
Y)
1210 GOSUB 2050+CODE A$(X-LX,Y-L
Y)
1220 REM
1230 LET X=X+FX
```

```
1240 LET Y=Y+FY
1250 IF A$(X,Y)=" " THEN GOTO 31
20+(30 AND X=P AND Y=Q)
1260 GOSUB 2060+CODE A$(X+LX,Y+L
Y)
1270 GOSUB 2070+CODE A$(X-LX,Y-L
Y)
1280 REM
1290 LET X=X+FX
1300 LET Y=Y+FY
1310 IF A$(X,Y)=" " THEN GOTO 31
80+(30 AND X=P AND Y=Q)
1320 GOSUB 2080+CODE A$(X+LX,Y+L
Y)
1330 GOSUB 2090+CODE A$(X-LX,Y-L
Y)
1340 REM
1350 LET X=X+FX
1360 LET Y=Y+FY
1370 IF A$(X,Y)=" " THEN GOTO 32
40+(30 AND X=P AND Y=Q)
1380 GOSUB 2100+CODE A$(X+LX,Y+L
Y)
1390 GOSUB 2110+CODE A$(X-LX,Y-L
Y)
1400 GOSUB 2250-CODE A$(X+FX,Y+F
Y)
1410 LET T=T-1
1412 SLOW
1415 IF INKEY$="" THEN PRINT AT
19,8;"TIME LEFT ";T
1416 IF U=P-1 AND V=Q THEN GOTO
4000
1420 IF INKEY$="" AND RND>.6 THE
N PRINT AT 20,5;"DISTANCE FROM E
XIT=";INT (ABS (U-P)+ABS (V-Q))
1425 IF T=0 THEN GOTO 5000
1430 RETURN
2000 PRINT AT 0,5;"▚";AT 18,5;"▞
"
2005 RETURN
2010 PRINT AT 0,24;"▞";AT 18,24;
"▚"
2015 RETURN
2020 PRINT AT 1,6;"▚";AT 2,7;"▚"
;AT 17,6;"▞";AT 16,7;"▞"
2025 RETURN
2030 PRINT AT 1,23;"▞";AT 2,22;"
▞";AT 17,23;"▚";AT 16,22;"▚"
2035 RETURN
2040 PRINT AT 3,8;"▚";AT 4,9;"▚"
;AT 15,8;"▞";AT 14,9;"▞"
2045 RETURN
2050 PRINT AT 3,21;"▞";AT 4,20;"
▞";AT 15,21;"▚";AT 14,20;"▚"
2055 RETURN
2060 PRINT AT 5,10;"▚";AT 6,11;"
▚";AT 13,10;"▞";AT 12,11;"▞"
2065 RETURN
2070 PRINT AT 5,19;"▞";AT 6,18;"
▞";AT 12,18;"▚";AT 13,19;"▚"
2075 RETURN
2080 PRINT AT 7,12;"▚";AT 11,12;
"▞"
2085 RETURN
2090 PRINT AT 7,17;"▞";AT 11,17;
"▚"
2095 RETURN
2100 PRINT AT 8,13;"▚";AT 10,13;
"▞"
2105 RETURN
2110 PRINT AT 8,16;"▞";AT 10,16;
"▚"
2115 RETURN
2120 PRINT AT 9,14;"▒▒"
2125 RETURN
2130 PRINT AT 1,5;"▀";AT 17,5;"▄
"
2135 RETURN
2140 PRINT AT 1,24;"▀";AT 17,24;
"▄"
2145 RETURN
2150 PRINT AT 1,5;"▌";AT 2,5;"▙
▄";AT 3,5;"▌▒";AT 4,5;"▌▒";AT
5,5;"▌▒";AT 6,5;"▌▒";AT 7,5;"▌
▒";AT 8,5;"▌▒";AT 9,5;"▌▒";AT
10,5;"▌▒";AT 11,5;"▌▒";AT 12,
5;"▌▒";AT 13,5;"▌▒";AT 14,5;"▌
▒";AT 15,5;"▌▒";AT 16,5;"▛▀";
AT 17,5;"▌"
2155 RETURN
2160 PRINT AT 1,24;"▐";AT 2,22;"
▄▟";AT 3,22;"▒▐";AT 4,22;"▒▐"
;AT 5,22;"▒▐";AT 6,22;"▒▐";AT
7,22;"▒▐";AT 8,22;"▒▐";AT 9,22
;"▒▐";AT 10,22;"▒▐";AT 11,22;"
▒▐";AT 12,22;"▒▐";AT 13,22;"▒
▐";AT 14,22;"▒▐";AT 15,22;"▒▐"
;AT 16,22;"▀▜";AT 17,24;"▐"
2165 RETURN
2170 PRINT AT 3,7;"▌";AT 4,7;"▙
▄";AT 5,7;"▌▒";AT 6,7;"▌▒";AT
7,7;"▌▒";AT 8,7;"▌▒";AT 9,7;"▌
▒";AT 10,7;"▌▒";AT 11,7;"▌▒";
AT 12,7;"▌▒";AT 13,7;"▌▒";AT 1
4,7;"▛▀";AT 15,7;"▌"
2175 RETURN
2180 PRINT AT 3,22;"▐";AT 4,20;"
▄▟";AT 5,20;"▒▐";AT 6,20;"▒▐"
;AT 7,20;"▒▐";AT 8,20;"▒▐";AT
9,20;"▒▐";AT 10,20;"▒▐";AT 11,
20;"▒▐";AT 12,20;"▒▐";AT 13,20
;"▒▐";AT 14,20;"▀▜";AT 15,22;"
▐"
2185 RETURN
2190 PRINT AT 5,9;"▌";AT 6,9;"▙
▄";AT 7,9;"▌▒";AT 8,9;"▌▒";AT
9,9;"▌▒";AT 10,9;"▌▒";AT 11,9;
"▌▒";AT 12,9;"▛▀";AT 13,9;"▌"
2195 RETURN
2200 PRINT AT 5,20;"▐";AT 6,18;"
▄▟";AT 7,18;"▒▐";AT 8,18;"▒▐"
;AT 9,18;"▒▐";AT 10,18;"▒▐";AT
 11,18;"▒▐";AT 12,18;"▀▜";AT 1
3,20;"▐"
2205 RETURN
2210 PRINT AT 7,11;"▙▄";AT 8,11;
"▌▒";AT 9,11;"▌▒";AT 10,11;"▌▒";
AT 11,11;"▛▀"
2215 RETURN
2220 PRINT AT 7,17;"▄▟";AT 8,17;
"▒▐";AT 9,17;"▒▐";AT 10,17;"▒▐";
AT 11,17;"▀▜"
2225 RETURN
2230 PRINT AT 8,12;"▙▄";AT 9,12;
"▌▒";AT 10,12;"▛▀"
2235 RETURN
2240 PRINT AT 8,16;"▄▟";AT 9,16;
"▒▐";AT 10,16;"▀▜"
2245 RETURN
2250 PRINT AT 8,14;"▄▄";AT 9,14;
"▒▒";AT 10,14;"▀▀"
2255 RETURN
3000 PRINT AT 1,6;"▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒"
3005 FOR N=2 TO 16
3010 PRINT AT N,6;"▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒"
3015 NEXT N
3020 PRINT AT 17,6;"▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒"
3025 GOTO 1410
3030 FOR N=1 TO 17
3035 PRINT AT N,6;"0000000000000
00000"
3040 NEXT N
3045 GOTO 1410
3060 PRINT AT 2,8;"▄▄▄▄▄▄▄▄▄▄▄▄▄
▄"
3065 FOR N=3 TO 15
3070 PRINT AT N,8;"▒▒▒▒▒▒▒▒▒▒▒▒▒
▒"
3075 NEXT N
3080 PRINT AT 16,8;"▀▀▀▀▀▀▀▀▀▀▀▀
▀▀"
3085 GOTO 1410
3090 FOR N=3 TO 15
3095 PRINT AT N,8;"0000000000000
0"
3100 NEXT N
3110 GOTO 1410
3120 PRINT AT 4,10;"▄▄▄▄▄▄▄▄▄▄"
```

```
3125 FOR N=5 TO 13
3130 PRINT AT N,10;"▒▒▒▒▒▒▒▒▒▒"
3135 NEXT N
3140 PRINT AT 14,10;"▄▄▄▄▄▄▄▄▄▄"
3145 GOTO 1410
3150 FOR N=5 TO 13
3155 PRINT AT N,10;"▣▣▣▣▣▣▣▣▣▣"
3160 NEXT N
3165 GOTO 1410
3180 PRINT AT 6,12;"▄▄▄▄▄▄"
3185 FOR N=7 TO 11
3190 PRINT AT N,12;"▒▒▒▒▒▒"
3195 NEXT N
3200 PRINT AT 12,12;"▀▀▀▀▀▀"
3205 GOTO 1410
3210 FOR N=7 TO 11
3215 PRINT AT N,12;"▣▣▣▣▣▣"
3220 NEXT N
3225 GOTO 1410
3240 PRINT AT 7,13;"▄▄▄▄";AT 8,1
3;"▒▒▒▒";AT 9,13;"▒▒▒▒";AT 10,13
;"▒▒▒▒";AT 11,13;"▀▀▀▀"
3245 GOTO 1410
3270 FOR N=8 TO 10
3275 PRINT AT N,13;"▣▣▣▣"
3280 NEXT N
3285 GOTO 1410
4000 PRINT "YOU MADE IT.....WELL
 DONE"
4010 FOR N=1 TO 160
4020 NEXT N
4030 SCROLL
4040 PRINT "TRY AGAIN?"
4050 INPUT Z$
4060 SCROLL
4070 IF Z$="Y" THEN RUN
4075 PRINT "OK THEN....BYE"
4080 STOP
5000 PRINT "YOU RAN OUT OF TIME.
.TOUGH"
5010 GOTO 4010
7000 CLS
7005 PRINT TAB 5;"******MAZE****
**"
7007 PRINT
7010 PRINT "THE OBJECT OF THIS G
AME IS TO"
7020 PRINT
7030 PRINT "ESCAPE FROM THE 3-D
MAZE BEFORE"
7040 PRINT
7050 PRINT "YOUR TIME RUNS OUT..
."
7060 PRINT
7070 PRINT "YOU MOVE USING THE K
EYS"
7080 PRINT
7090 PRINT "5 TURN LEFT";TAB 0;"
7 FOWARDS";TAB 0;"9 TURN RIGHT"
7100 PRINT
7110 PRINT "THE EXIT IS SHOWN ▣▣
▣"
7120 PRINT
7130 PRINT "PLEASE WAIT WHILE TH
E GAME"
7140 PRINT
7150 PRINT "IS SET UP..."
8000 DIM A$(27,27)
8010 DIM P(8,2)
8015 LET Z$="21120110"
8020 FOR N=1 TO 4
8025 LET P(N,1)=VAL Z$(N*2-1)-1
8030 LET P(N,2)=VAL Z$(N*2)-1
8035 LET P(N+4,1)=P(N,1)
8040 LET P(N+4,2)=P(N,2)
8045 NEXT N
8050 LET Z$="▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀
▀▀▀▀▀▀"
8055 FOR N=2 TO 22 STEP 4
8060 LET A$(N)=Z$
8065 LET A$(N+1,2)="▙"
8070 LET A$(N+2,2)="▌"
8072 LET A$(N+3,2)="▛"
8075 LET A$(N+1,26)="▟"
8080 LET A$(N+2,26)="▐"
8082 LET A$(N+3,26)="▜"
8085 FOR M=2 TO 22 STEP 4
8090 GOTO 8095+5*(INT (RND*1.6))
8095 LET A$(N+1,M)="▙"
8100 LET A$(N+3,M)="▛"
8105 IF RND>.5 AND A$(N+1,M)="▙"
 OR A$(N+3,M)="▙" THEN LET A$(N+
2,M)="▙"
8109 NEXT M
8110 NEXT N
8115 LET A$(26)=Z$
8120 LET P=14+4*INT (RND*3)
8125 LET Q=6+4*INT (RND*5)
8130 LET A$(P+1,Q)="▙"
8135 LET A$(P+2,Q)=" "
8137 LET A$(P+3,Q)=" "
8140 LET A$(P-1,Q)="▙"
8145 LET A$(P-2,Q)="▌"
8147 LET A$(P-3,Q)="▛"
8150 LET A$(P-5,Q)="▛"
8152 LET A$(P,Q-1)=" "
8154 LET A$(P,Q+1)=" "
8156 LET A$(P-6,Q)="▌"
8158 LET A$(P-7,Q)="▙"
8160 LET P=P+2
8170 LET T=151
8410 LET U=2+24*INT (RND*2)
8420 LET V=2
8430 LET D=5+(U=26)
8432 LET Z=4+4*INT (RND*6)
8435 FOR N=1 TO 3
8440 LET A$(6+4*INT (RND*5),Z)="
"
8445 NEXT N
8450 CLS
8799 RETURN
8900 CLEAR
8910 SAVE "MAZE"
8920 RUN
9000 STOP
```



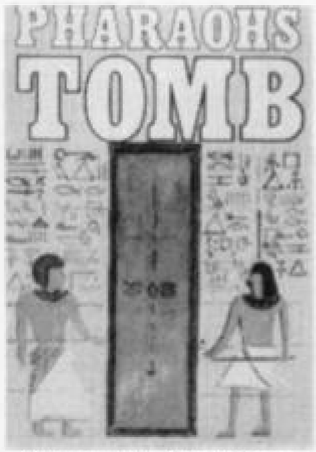
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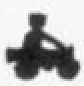
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QUESTIONNAIRE

READER QUESTIONNAIRE

As I said in the Welcome section, this is your magazine and, in order to check that it contains what the majority of you want, I would be pleased if you would complete and return this questionnaire.

NAME: AGE:

ADDRESS:

COMPUTER OWNED (if any):
How long have you had a computer?
Most frequent use:
GAMES: PROGRAMMING: OTHER:

ZX COMPUTING
Are you a:
REGULAR READER: NEW READER: OCCASIONAL READER:

Allocation of space:

	Too Much	Just Right	Too Little
GAMES			
UTILITIES			
REVIEWS			
NEWS			
ARTICLES:			
General			
Hints'n Tips			
Machine Code			

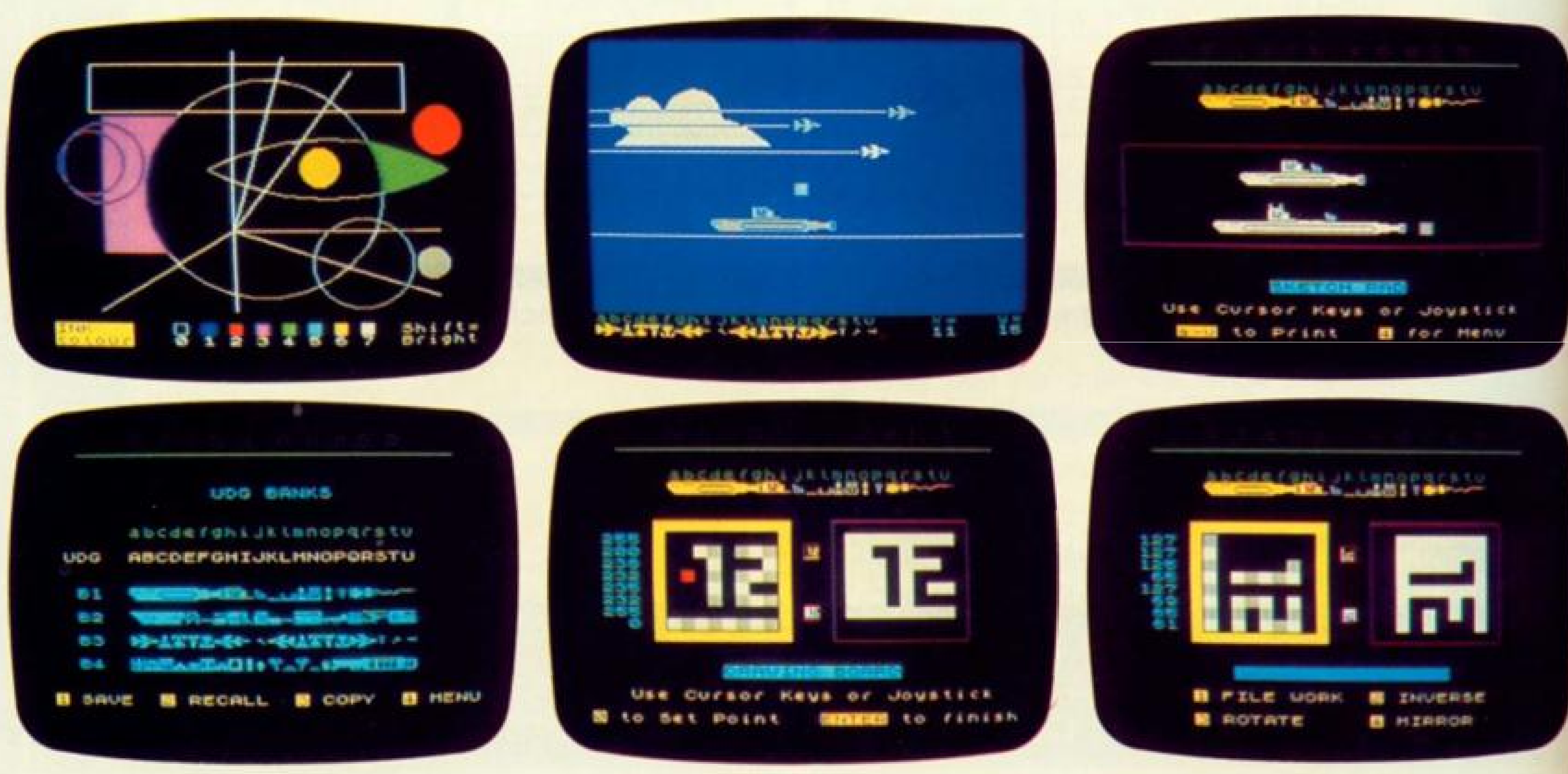
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THE MOST IMAGINATIVE GRAPHICS PROGRAMMING SOFTWARE FOR YOUR SPECTRUM.



The soft touch

James Walsh gives us his views on some more Spectrum Software.

Laser Snaker — PoppySoft

Laser Snaker is written for the 48K Spectrum, and is based around the theme of the traditional snake game in which the snake must eat the eggs. Fortunately, 'Laser Snaker' has a few added extras. The scenario goes as follows:

The laser snake must penetrate the hidden depths of the egg plantation and discover the secret symbol which is your key to success and fortune. Fortune? Yes, there is a £100 prize to be won, not quite a fortune but very nice for just playing games. Lurking in the plantation are Aggronoids, vicious green monsters. There is also the snake's arch enemy the Blue Viproid, who also spends his time eating the eggs, and will cause you to be destroyed if you hit him. Your snake has a laser, this is definitely a mutation of the technological age, as I am sure that when I was taught about snakes they still used venom! Anyway, this laser is capable of slicing up a Viproid or destroying an Aggronoid. If a Viproid is hit straight between the eyes he will return to an egg, which can be gobbled up. Death chrystoids appear and must either be shot or avoided. Many mazes must be penetrated before heading for the power crystal. This rejuvenates the snake, and puts you to a higher status level.

Though the idea of the game is not particularly original, this is, for the most part made up for by the colourful graphics, lightning speed and versatility of play. As a beginner a training level may be selected to give yourself a decent chance. Speed may be increased up to a near impossible level. Difficulty can also be selected independently of the speed. A problem is caused by the rather thoughtless selection of the cursor keys for controlling the snake — they are far from logically placed for movements. Obviously the use of the correct joystick would solve this problem.

Apart from this flaw the game is colourful, exciting and a pleasure to play, even if it is not the most innovative piece of software on sale today.

Chequered Flag — Psion

Chequered Flag, writtenfor the 48K Spectrum by Psion is, as usual on sale under the Sinclair flag.

Psion have produced probably the first top quality motor racing simulation program for the Spectrum. It uses some of the most colourful and exciting graphics yet seen on the Spectrum.

Not surprisingly the aim of the game is to negotiate your way round any of a selection of circuits selectable before you start. But nothing is that simple. The corners are tight, and must be taken at speed. There are hazards on the road — oil, water and glass. The screen is basically split up into two sections. The top two thirds is used to display the road and hazards ahead. Whilst the lower third displays various meters vital to the running of a car. The dashboard features fully analogue: fuel gauge, rev counter and temperature gauge. The gear stick is displayed showing what gear the car is in. Finally there is the steering wheel, which rotates as the car is cornered. The road and other hazards are displayed fast and furiously in realistic hi-res graphics. The effect is quite stunning.

When the game is loaded it displays a choice of ten different tracks of varying shapes and sizes. You are also given a choice of three formula one racing cars — the Feretti Turbo, Psion Pegasus and McFaster Special. Each car having a different performance and handling characteristics. The McFaster Special has an automatic gearbox, which is exceedingly useful for the beginner.

Once you have set off, you must do your utmost to avoid such hazards as oil, water, glass and rocks. If your car is damaged, or needs refuelling you may pull into the pits and get attention. The overall feel of the car is surprisingly close to the real thing. The engine sound effects allows you to gauge whether the engine is being over or under revved.

Chequered Flag is one of the best programs sold for the Spectrum. It is an exciting, graphically impressive and highly enjoyable game to play — definitely a winner.

Gangsters! — CCS Strategy Games

Written for the 48K Spectrum, as the name implies, this is a game involving 1920's style gangsters, but this is where the obvious part ends. Surprisingly enough this is not a game of the shoot-em-up variety, has nothing to do with space, and does not use high speed hi-res graphics. Rather it is a game of strategy, thought and cunning. As with other CCS games, Gangsters! is based on your feeding the computer with various decisions on spending and deployment of non-capital resources ie manpower etc. With the computer returning facts and figures on your success or failure.

Gangsters! is set in the US during the 20's and is based around the legendary gangland activity of the time. The aim of the game is to take over the City from the other gang leaders. To do this you must take control of the assets, make raids, kill off the other gangsters and their leaders, whilst also managing to stay alive yourself.

There are nine levels of play — an advantageous factor for the beginner. You are given a certain amount of money depending upon level of play. With this money assets may be bought — Speakeasies, Distilleries, Casinos, Brothels, as well as gangsters. At all time you must have enough men to carry out raids, sufficient protection to safeguard yourself, as well as spare cash for bribery. The game is fully interactive hence the opposing gangsters are likely to raid your assets and hunt for your weapons.

Gangsters! has been well put together, nicely presented, and the instructions are also well thought out. The scenario is original in many respects. It gives the idea of strategy games a new breath of life. Finally I have to say that it is excellent and well worth the money.

Battle of the Toothpaste Tubes — Castle Colditz — K-Tel

So someone was short of a real theme; with a name like 'Battle of the Toothpaste Tubes' who can take it seriously? Fortunately the title does not do credit to the game itself. It has been imaginatively conceived with the use of fast-moving high resolution graphics as well as entertaining sound effects.

You must fire the toothpaste onto the heads of the toothbrushes. If you miss and hit the handles it will rebound and hit you. Mini tubes fire at you, you can protect yourself with a flouride shield or simply by firing at them. Lastly, beware the chattering teeth, they can penetrate shields — one bite is lethal.

Being given a healthy number of lives to begin with produces a sense of security, to stay alive is not easy, you must be constantly alert and on your toes.

'Battle of the Toothpaste Tubes' (BTT) is a good game, thought the scenario is corny to say the least. But above all it is fun to play.

Castle Colditz is an adventure game, in which you are being held prisoner in — of course, the Castle Colditz. Surprise, surprise, your task is to escape! To this end you must make your way from the prisoners' room, through a complexed arrangement of tunnels and passages to the Front Gate and freedom.

Sadly, this game is without graphics, which is rather annoying and poor for an adventure game of today. There may well be too many tunnels and passages for you to remember hence necessitating the drawing of a

map. As you wander you may collect various object which are scattered around. There seems to be rather an abundance of treasure here.

Castle Colditz on its own is far from inspring, and certainly not a program to be bought on its own, but sold with BTT it makes much better sense. Overall this cassette is good, but far from mindblowing, especially as the product of such a well established company as K-Tel.

Rabbit Shoot —Phipps Associates

Phipps Associates has a good name for producing quality adventure games. Rabbit Shoot is for the 16K machine, and definitely breaks that.

You are a poacher and your task is to shoot as many rabbits as possible, whilst they hop around the enclosure. But there is a time limit, for after about two minutes the warden appears out of nowhere and catches you.

Within the game itself you are represented by a small cross that shoots funny shaped fireballs. Is you miss, the rabbit at which you were aiming will disappear for a second or two.

Unfortunately Rabbit Shoot definitely does not live up to the normal high standard expected of Phipps Associates. Though worse has been seen, this game is dull and uninteresting.

Space Island — Terminal Software

Space Island is set in the year 2651 on the planet Zyro. 20000 years ago the Avafad people of Zyro developed Timespread, a machine which enables matter to be reduced to zero mass, thus making it transportable at speeds greater than that of light itself. Hence time can be changed.

Your objective is to disable Timespread and return it to Earth because it has been causing time distortion around the planet Zyro. Unfortunately this is where the trouble starts, when you try and land a survey ship on the island Roba, where Timespread is situated, your ship is destroyed by Timespread's highly sophisticated defence system. There is only one survivor left on Roba, one of your androids, who is situated on a small island west of Roba itself. Your only chance is to carefully guide this android to the island Roba where it can disable Timespread.



You are shown an overhead view of Roba and the surrounding islands, whilst the android is represented by a small cross. Occasionally the android will talk to you, asking for assistance. This is a real time game, so there is little time to sit back and think.

Space Island is reasonably original, complicated in some respects, whilst simple in its concept. A good game well worth considering for the long dark evenings.

The Tomb of Dracula — Felix Software

The Tomb of Dracula has been written for the 48K Spectrum and, as might be gathered from the title, is an adventure type game. But fortunately it does not come into the category of 'Just another Adventure Game', as do so many others. Extensive use has been made of high resolution graphics and sound.

The object of the game is to work your way through the tomb to find Dracula's treasure before the sun sets and he arises to follow you around. Even by day there are Zombies, Ghouls and Slime Pits to contend with. The tomb is large and complicated, hence it is possible to display a plan of the tomb. If you land on a staircase it may lead to the £500,000 Vampires Treasure and you will have won the game. More likely it will lead down to the next level of the tomb, where the rewards and penalties are greater. Wherever you go you will be able to collect stakes for future use.

The graphics are good and the sound fun, which makes for a very enjoyable and exciting game. One that can be well recommended.

Ghost Town — Virgin Games

Ghost Town is set in a deserted American town, abandoned after the California Gold Rush. It is not as easy to play as most other adventure games, but is quite a challenge for anyone who likes long adventure games.

Your aim is to find old Jake Clampett's gold mine and return to the Town Square with the gold. But beware the sweltering heat of the desert, and steer clear of the Sheriff's Office if possible, for if you carelessly wander into one of the cells the door will slam shut and you will be trapped. The only major fault of the game is that it has limited graphics, so consequently it will only appeal to the more serious games player.

Ghost Town is not as much fun or as exciting as most other adventure games, but it is reasonably good value for money.

Addresses of suppliers

Poppy Soft, The Close, Common Road, Headley, Newbury, Berkshire.

Sinclair Research Ltd., Stanhope Road, Camberley, Surrey GU15 3PS

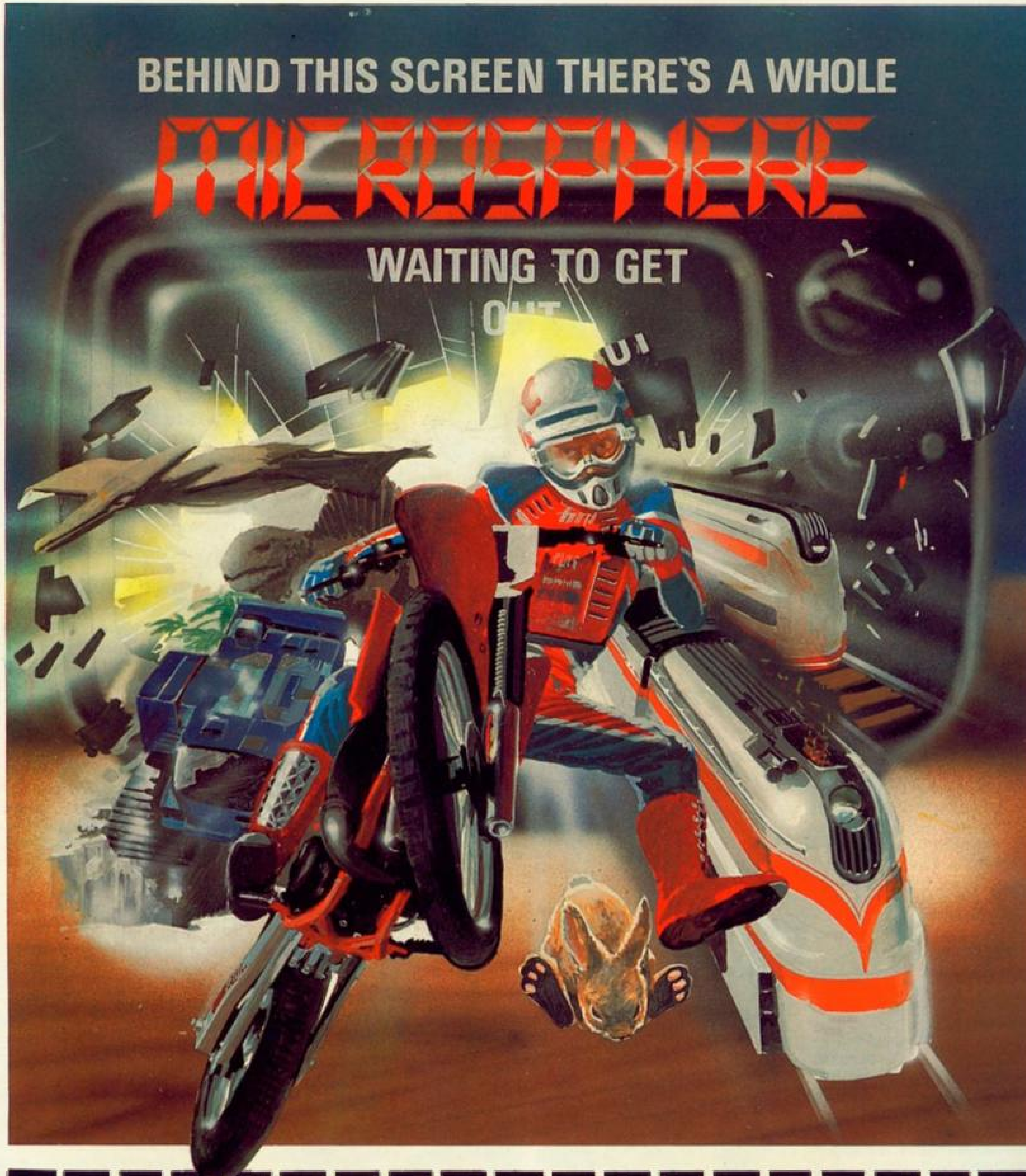
CCS Strategy Games, 14 Langton Way, London SE3 7TL

Phipps Associates, Freepost EM463, 172 Kingston Road, Ewell, Surrey KT19 0BR

Terminal Software, 28 Church Lane, Prestwich, Manchester M25 5AJ

Felix Software, 19 Leighton Avenue, Pinner, HA5 3BW

Virgin Games, 61-63 Portobello Road, London W11 3DD



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(Home Computing Weekly 27/9/83)

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(Home Computing Weekly 3/6/83)

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MACHINE SPECIFICATIONS

ZX80

Dimensions
Width 174mm (6.85 in)
Depth 218mm (8.58 in)
Height 38 mm (1. 5 in)
Weight 300g (10.5oz)

Microprocessor/Memory
Z80A 3.25 MHz clock
ROM: 4K bytes containing BASIC
RAM: 1K bytes internal, externally expandable to 16K bytes.

Display
Requires an ordinary domestic black and white colour TV. The lead supplied connects between the ZX80 and your TV's aerial socket. The display organisation is 24 lines of 32 characters per line showing black characters on a white screen. The ZX80 does not connect to a printer.

Programming
Programs can be entered on the keyboard or loaded from cassette. The ZX80 has automatic "wrap round" so lines of program can be any length but not multi-statement lines.

Syntax check
The syntax of the entered line is checked character by character. A syntax error cursor marks the first place the syntax breaks down if there is an error. Once any errors have been edited out the syntax error cursor disappears. Only syntax error-free lines of code are accepted by the ZX80.

Graphics
Total of 22 graphics symbols giving 48 x 64 pixels resolution consisting of 10 symbols plus space and inverses. Includes symbols for drawing bar charts. Under control of your BASIC program any character can be printed in reverse field.

Editing
The line edit allows you to edit any line of program or input including statement numbers. The edit and cursor control keys are EDIT, RUBOUT, HOME.

Arithmetic
Arithmetic operators +,–,x, ÷ exponentiate. Relational operators <, >, = , yielding 0 or – 1. Logical operators AND OR NOT yielding boolean result. Relational operators also apply to strings. ZX80 BASIC uses 16 bit two's complement arithmetic (± 32767).

Variables
Numeric variable names may be any length, must begin with a letter and consist of alphanumerics. Every character in the name is compared thus an infinity of unique names is available.

String variables may be assigned to or from, shortened but not concatenated. String variable names are A$ – Z$. Strings do not require a dimension statement and can be any length.

Arrays have a maximum dimension of 255 (256 elements) each. Array names consist of a single letter A–Z.

Control variable names in FOR. . . NEXT loops consist of a single letter A–Z.

Expression evaluator
The full expression evaluator is called whenever a constant or variable is encountered during program execution. This allows you to use expressions in place of constants especially useful in GOTOs, GOSUBs, FOR. . . NEXT etc.

Immediate mode
The ZX80 will function in the "calculator mode" by immediately executing a statement if it is not preceded with a line number.

Cassette interface
Works with most domestic cassette recorders. The transfer rate is 250 baud using a unique tape-recording format. Other systems are not compatible with the ZX80's. The ZX80 also SAVEs the variables as well as the program on cassette. Therefore you can save the data for updating next time the program is executed. The ZX80 does not support separate data files. The lead supplied with the ZX80 is fitted with 3.5mm jack plugs.

Expansion bus
At the rear has 8 data, 16 address, 13 control lines from the processor and Ov, 5v, 9-11v, Ø̄ and internal memory control line. These signals enable you to interface the ZX80 to your own electronics, PIO, CTC, SIO if you want I/O ports etc.

Power supply
The ZX80 requires approximately 400mA from 7–11v DC. It has its own internal 5v regulator.

TV standard
The ZX80 is designed to work with UHF TVs (channel 36)and is the version required for use in the United Kingdom. The ZX80 USA is designed to work with a VHF TV(American channel 2. European channel 3) and is the version required for the American TV system, also for countries without UHF.

ZX81

Dimensions
Width 167mm (6.32 in)
Depth 175mm (6.80 in)
Height 40 mm (1.57 in)
Weight 350 gms (12.15 oz)

Microprocessor/Memory
Z80A 3.25 MHz clock
ROM: Containing 8K BASIC interpreter
RAM: 1K bytes internal, externally expandable to 16K bytes.

Keyboard
40 key touch-sensitive membrane. Using function mode and single press key-word system, this gives the equivalent of 91 keys and also graphics mode allows an additional 20 graphical and 54 inverse video characters to be entered directly.

Display
Requires an ordinary domestic black and white or colour TV. The aerial lead supplied connects the ZX81 to the TV aerial socket. The display is organised as 24 lines of 32 characters with black characters on a white background.

Two mode speeds
The ZX81 can operate in two software-selectable modes - FAST and NORMAL. FAST is ideal for really high-speed computing. In NORMAL mode however the ZX81 allows continuously moving, flicker-free animated displays.

Printer
The 8K ROM will permit instructions (LPRINT, LLIST and COPY) to drive the Sinclair ZX Printer.

Programming
Programs can be entered via the keyboard or loaded from cassette. Programs and data can be saved onto cassette so that they

are not lost when the ZX81 is turned off.

Syntax check

The syntax of a line of program is checked on entry. A syntax error cursor marks the first place the syntax breaks down if there is an error. The syntax error cursor disappears when errors have been corrected. Only lines free from syntax errors will be entered into the program.

Graphics

Apart from the 20 graphics characters, space and its inverse, the display may also be divided into 64 x 44 pixels, each of which may be 'blacked' in or 'whited' out under program control.

Editing

A line editor allows you to edit any line of program or input, including program line numbers. Lines may be deleted, increased or decreased in size.

Arithmetic

Arithmetic operators +, –, x, ÷, exponentiate. Relational operators =, < >, >, <, < =, >=, may compare string and arithmetic variables to yeild 0 (False) or 1(True). Logical operators AND, OR, NOT yield boolean results.

Floating-point numbers

Numbers are stored in 5 bytes in floating-point binary form giving a range of $\pm 3 \times 10^{-39}$ to $\pm 7 \times 10^{38}$ accurate to 9½ decimal digits.

Scientific functions

Natural logs/antilogs; SIN, COS, TAN and their inverses;SQR; e^x.

Variables

Numerical:	any letter followed by alphanumerics
String:	A$ to Z$
FOR-NEXT loops:	A–Z (loops may be nested to any depth.
Numerical arrays:	A–Z
String arrays:	A$ to Z$

Arrays

Arrays may be multi-dimensional with subscripts starting at 1.

Expression evaluator

The full expression evaluator is called whenever an expression, constant or variable is encountered during program execution. This powerful feature allows use of expressions in place of constants and is especially useful in GOTO, GOSUB etc.

Command mode

The ZX81 will execute statements immediately, enabling it to perform like a calculator.

Cassette interface

Works using domestic cassette recorders. The transfer rate is 250 baud and uses a unique recording format not compatible with other systems. The ZX81 will save the data as well as the program to avoid the need to re-enter the data when the program is next loaded.,

ZX81 will search through a tape for the required program). The cassette leads supplied have 3.5 mm jack plugs.

Expansion port

At the rear, this has the full data, address and control buses from the Z80A CPU as well as OV, +5V, +9V,$\overline{Ø}$ and the memory select lines. These signals enable you to interface the ZX81 to the Sinclair 16K RAM pack and ZX printer.

Power supply

The ZX81 requires approximately 420mA at 7–11V DC. It has its own internal 5V regulator. The ready assembled ZX81 comes complete with a power supply. The ZX81 kit does not include a power supply.

TV standard

The ZX81 is designed to work with UHF TVs (channel 36) 625 lines.

ZX SPECTRUM

Dimensions

Width 233 mm
Depth 144 mm
Height 30 mm

CPU/Memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.
16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-key keyboard with upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

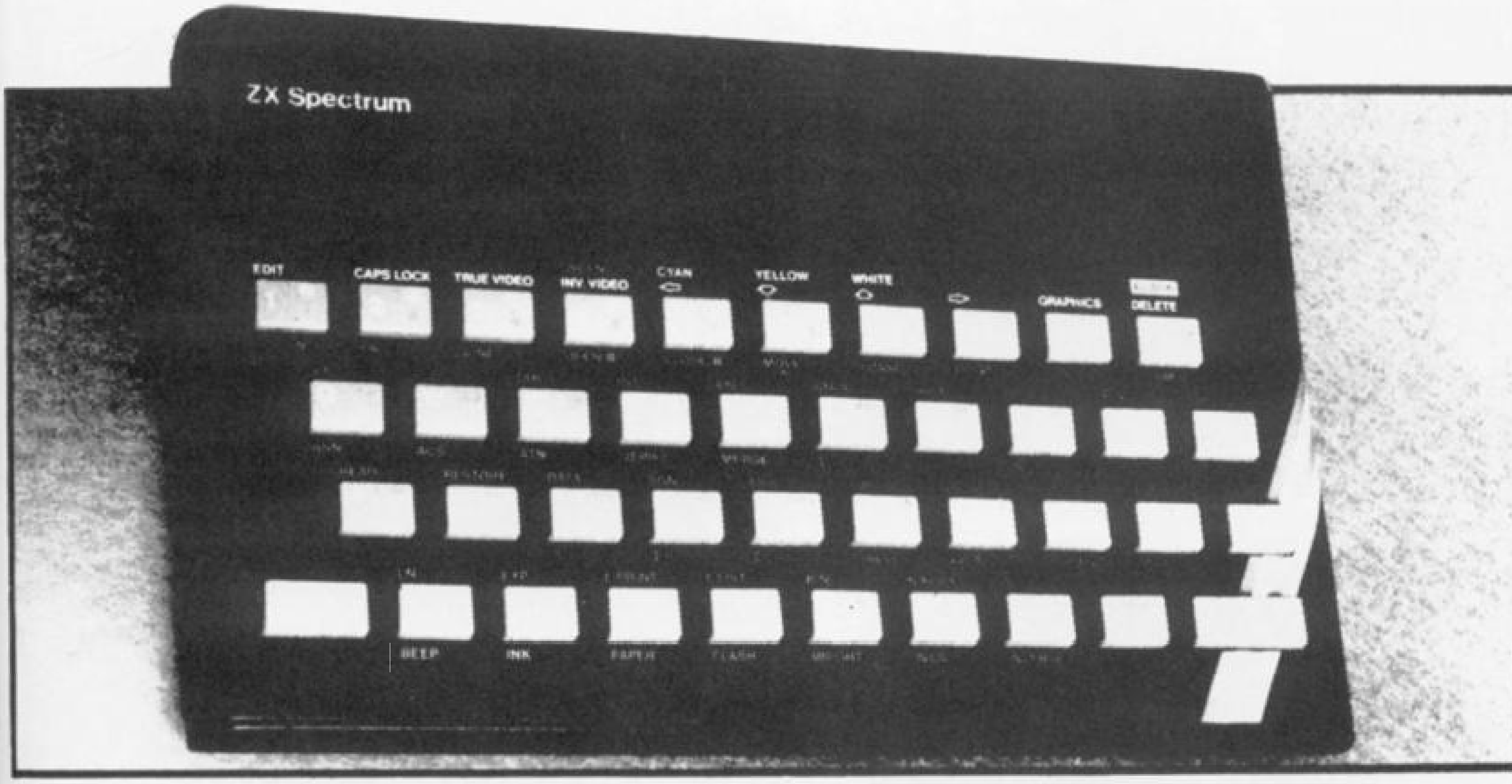
Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive — or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magneta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section — normally the first 22 lines — displays the program listing or the results of program or command execution. The bottom section — normally the last 2 lines — shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages: Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.



Mathematical Operations And Functions

Arithmetic operations of +, −, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generation, and pi.

Numbers are stored as five bytes of floating point binary — giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits. Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String Operations And Functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code. A string slicing mechanism exists, using the form a$ (x TO y).

Variable Names

Numeric — any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).

String — A$ to Z$.

FOR-NEXT loops — A-Z.

Numeric arrays — A-Z.

String arrays — A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression Evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette Interface

A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion Port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives. IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 Compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

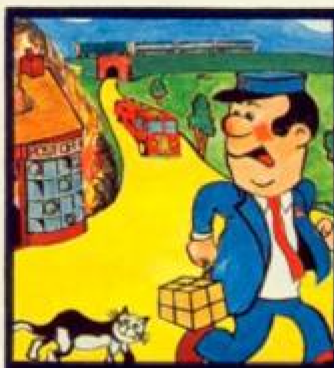
FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.


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48K Spectrum. £6.95



Cruise Attack
Save the city from annihilation in this wonderful version of an arcade favourite. Nine skill levels, bonus points for attack ships.
48K Spectrum. £6.95



Nanas
Catch the bananas, miss the coconuts. Easy? Try it and see. Simple in concept, hilariously entertaining – it'll drive you bananas.
16K Spectrum. £5.95



Timequest
A warp-space accident spreads your capsule across time. As you land in each new era, fresh perils face you. A very skillful graphic adventure
48K Spectrum. £6.95



One Hundred & Eighty
That famous shout tells you what it's all about! A good implementation of a difficult game – doubles, trebles, twenty-five and bull all possible.
48K Spectrum. £6.95



Land of Sagan
A quest to find the long lost Staff of Health. Is it in one of the castles? Or in the Tower? There are plenty of problems – and plenty of opponents – in this great graphic adventure.
48K Spectrum. £6.95



Creepy Crawler
An authentic version of one of the most addictive arcade games devised. All the usual features (Centipede, Spider, Bug, etc) with full use of Spectrum graphics and sound.
16K Spectrum. £5.95



Mad Martha II
Great sequel to the best-selling Mad Martha. Hilarious graphic adventure, with hero Henry in sunny Spain, beset by wacky waiters, mad bulls and the wrathful Martha.
48K Spectrum. £6.95



SAS Assault
Your mission – rescue the Russian ambassador from terrorist kidnappers, before the Kremlin declares war. Loads in two parts – your rating in the second depends on your skill in the first.
48K Spectrum. £6.95



Star Trek
Defend the star systems against the Klingon attack. Runs in real time – so you have to make the right decisions fast!
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Drakmaze
Find your way round Dracula's domain. A game to get your teeth into!
48K Spectrum. £6.95



Laserwarp
Invaders, Aliens, this game has the lot – and you have to survive to destroy the Master! Simple controls, far from simple task.
48K Spectrum. £6.95



Knockout
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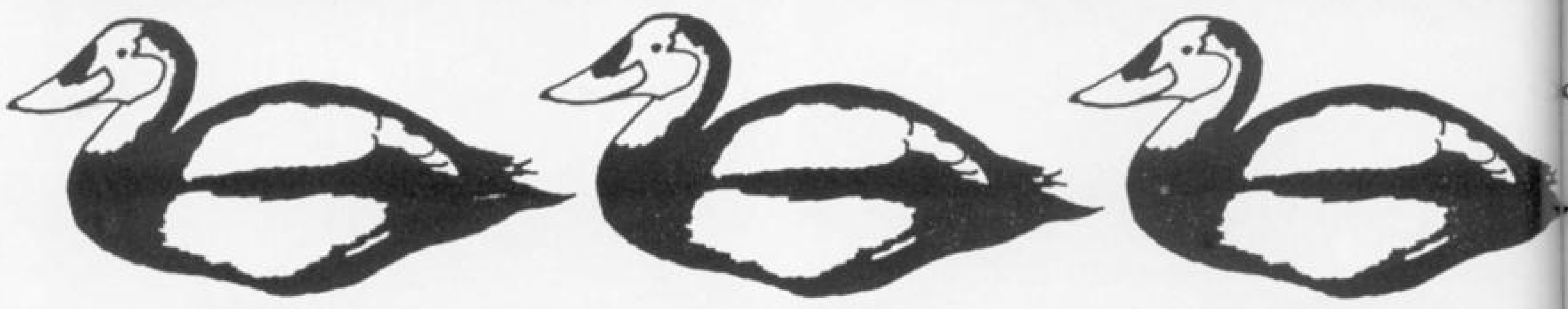
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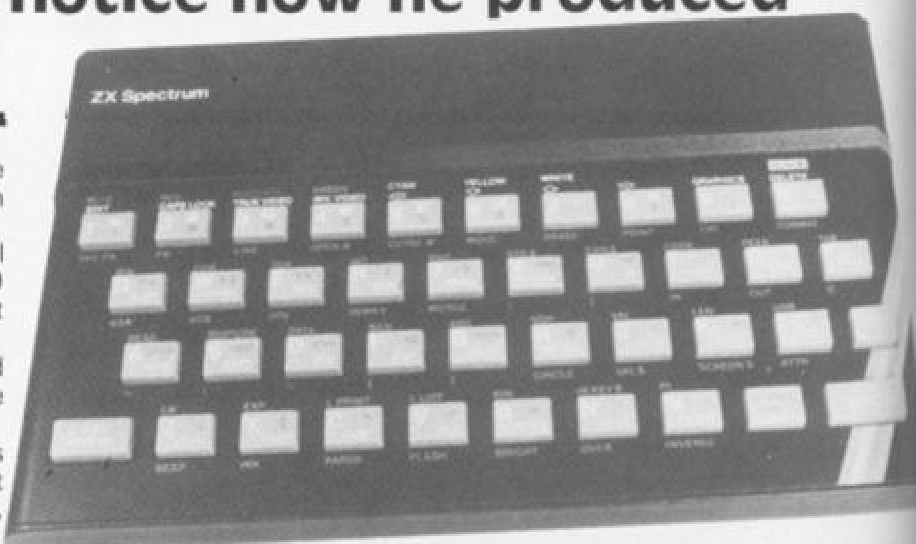
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Duck shoot

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Fowl play?

As the game starts, a row of 10 cute little yellow ducks will appear at the top of the screen. They zoom across the screen from right to left and, yes you guessed it, you have to try your hand at shooting them. You are armed with a light blue gun (printed as an upside-down T).

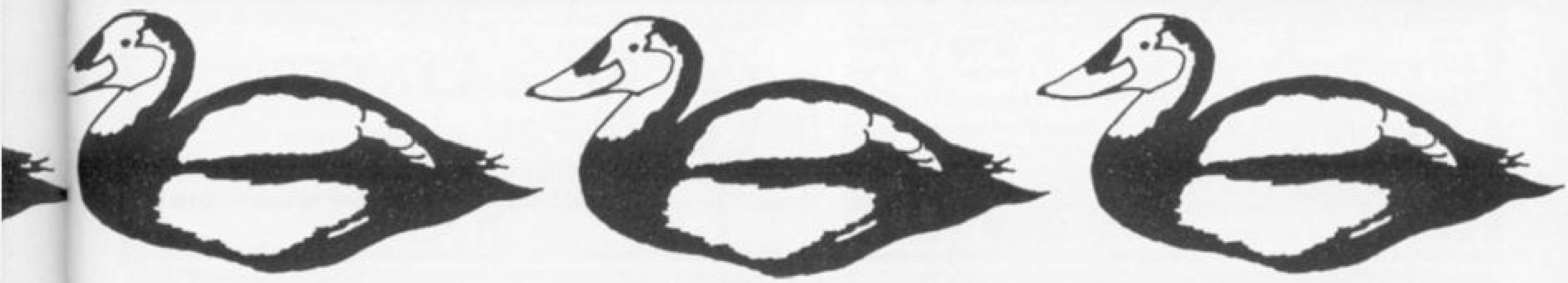
The keys from 1 to 5 will move you to the left, keys 8, 9 and 0 will move you to the right and key 7 fires the gun.

You are given 15 bullets and your score is printed up at the end — out of 10.

Don't be fooled — this game is not anywhere as easy as it sounds — so get shooting, cowboy!

```
   1 POKE  USR "a", BIN 00000000: POKE  USR "a"+1, BIN 00000000: POKE  USR "a"+2
, BIN 01100000: POKE  USR "a"+3, BIN 11100001: POKE  USR "a"+4, BIN 00111110: PO
KE  USR "a"+5, BIN 00011110: POKE  USR "a"+6, BIN 00000000: POKE  USR "a"+7, BIN
 00000000
   2 POKE  USR "b", BIN 00011000: POKE  USR "b"+1, BIN 00011000: POKE  USR "b"+2
, BIN 00011000: POKE  USR "b"+3, BIN 00011000: POKE  USR "b"+4, BIN 00011000: PO
KE  USR "b"+5, BIN 00011000: POKE  USR "b"+6, BIN 11111111: POKE  USR "b"+7, BIN
 11111111
   3 LET a=0
   4 LET c=10: LET e=10: LET f=9
   5 LET s=0
   6 LET l=0
   9 LET b=0
  10 FOR q=1 TO 9
  16 BORDER 0: PAPER 0: INK 6
  19 LET q$="A  A  A  A  A  A  A  A  A  A  "
  20 IF q$="                              " THEN  GO TO 600
  22 GO TO 1000
  25 INK 6: PRINT  AT 0,0;q$
  30 LET q$=q$(2 TO )+q$(1)
  34 BEEP .01,-20
  40 INK 5: PRINT  AT c,e;" B "
```

STOP! Before typing in this program, please see the Editor's note in the Welcome section.



```
 50 IF  INKEY$ ="7" THEN  GO TO 100
 60 IF  INKEY$ ="5" THEN  LET e=e-1: BEEP .005,45
 70 IF  INKEY$ ="8" THEN  LET e=e+1: BEEP .005,45
 80 GO TO 25
 96 PAUSE 0
 97 IF  INKEY$ ="n" THEN  STOP
 98 IF  INKEY$ ="y" THEN  RUN
 99 IF  INKEY$ ="" THEN  GO TO 96
100 LET c$="."
101 LET e=e+1: PRINT  AT 0,0;"                                "
103 INK 6: PRINT  AT 0,0;q$
105 IF q$="                                " THEN  GO TO 600
106 FOR q=40 TO 48
107 INK 6
108 INK 2
109 LET l=l+1: IF l=138 THEN  FLASH 1: PRINT  AT 10,7;"OUT OF BULLETS!!": BEEP
3,-18: GO TO 600
110 PRINT  AT f,e;c$: FOR k=1 TO 8: NEXT k: PRINT  AT f,e;" "
120 LET f=f-1
125 BEEP .005,q
130 NEXT q
150 LET f=9
160 LET e=e-1
560 IF q$(e+2) <> " " THEN  LET q$(e+2)=" ": LET s=s+1
565 PRINT  AT 0,0;q$
566 IF s=10 THEN  GO TO 600
570 IF  INKEY$ ="7" THEN  GO TO 100
580 GO TO 25
600 FLASH 0: CLS : INK 6: PRINT  AT 10,10; INVERSE 1;"SCORE="; INVERSE 0;s
601 PRINT  AT 13,0;"'y'to play again or 'n'to stop ?"
602 FLASH 1: INVERSE 1: IF s >= 10 THEN  PRINT  AT 11,0;"you have the fastest g
un in the N.W.!": FOR i=50 TO 20 STEP -1: BEEP .1,i: NEXT i
603 PAUSE 0: FLASH 0
604 IF  INKEY$ ="n" THEN  STOP
605 IF  INKEY$ ="y" THEN  RUN
610 IF  INKEY$ ="" THEN  GO TO 602
1000 INK 0: PAPER 5: BORDER 5: INVERSE 1: CLS
1001 PRINT  AT 1,8;"***DUCK SHOOT***"
1002 INVERSE 0: PRINT  AT 2,0;"***@ M.Savin 1982***"
1003 INK 1
1005 PRINT  AT 4,0;" use <"; INVERSE 1;"5"; INVERSE 0;" to move to the left and
"; INVERSE 1;"8"; INVERSE 0;"> to move right and "; INVERSE 1;"7"; INVERSE 0;" t
o "; INVERSE 1;"FIRE!!"; INVERSE 0;"(you have 10 ducks to shoot at  and 15 bulle
ts) "; AT 10,10; INVERSE 1;"GOOD LUCK!!"; INVERSE 0
1012 BORDER 0: PAPER 0: INK 6
1015 PRINT  AT 20,3;"press any key to continue"
1018 PAUSE 0
1019 INK 6
1020 CLS : GO TO 25
```

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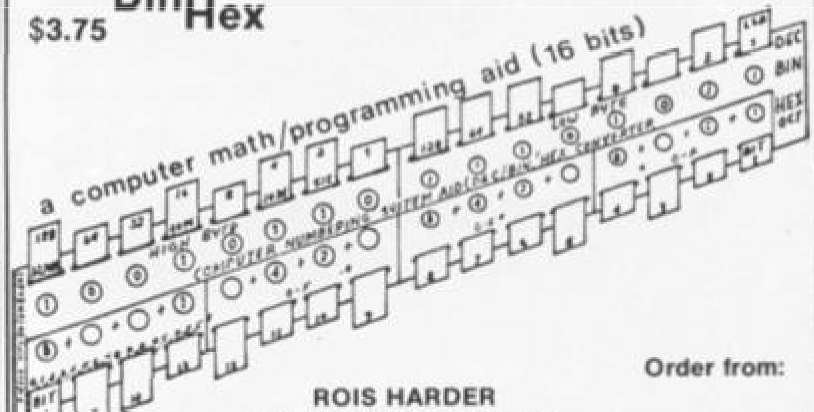
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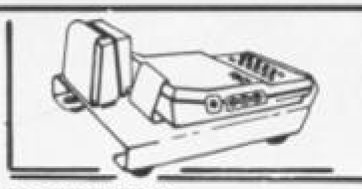
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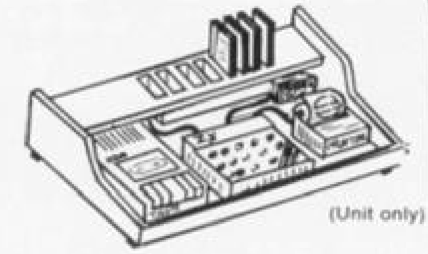
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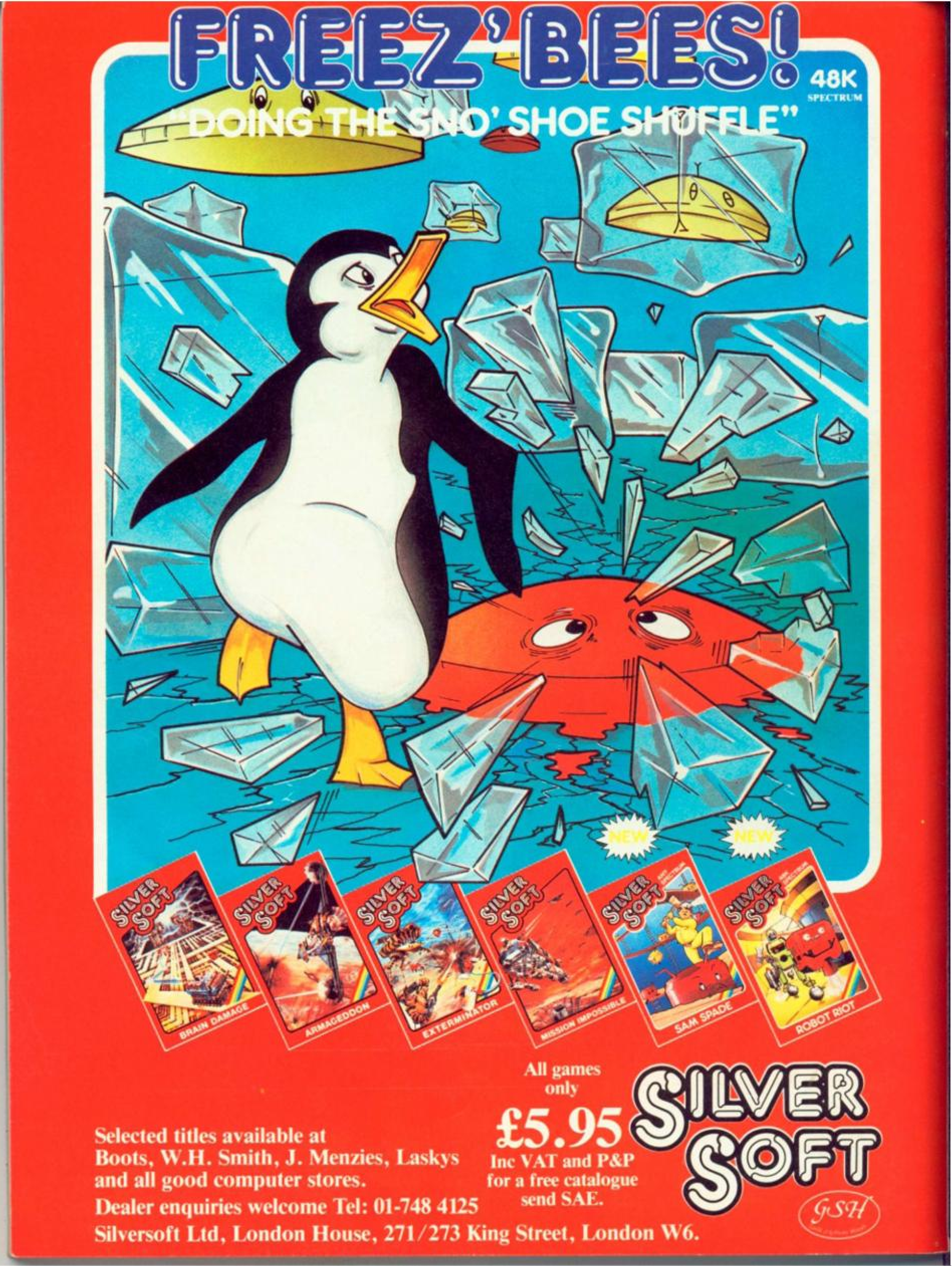
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